The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXIV, No. 10 CHICAGO May 7, 1921

EDITORIAL DEPARTMENT—

Nathan C. Rockwood, Editor
Chas. A. Breskin, Assistant Editor
L. R. Croy, Assistant Editor

ADVERTISING STAFF—

Charles H. Fuller, Eastern Manager,
101 West 41st Street, New York City

G. J. Nelson
A. S. Barnett
Western Representatives

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ROCK PRODUCTS—

Geo. P. Miller, Manager

Published every other Saturday by

TRADEPRESS PUBLISHING CORP.
542 South Dearborn Street, Chicago, Ill.

W. D. Callender, President.
N. C. Rockwood, Vice-President.
Geo. P. Miller, Treasurer.
C. O. Nelson, Secretary.

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25,000,000 TONS
OF GROUND LIMESTONE

THE farmers need twenty-five million tons of ground limestone per year, while only four million tons are produced.

The Hardinge Mill grinds limestone at 15 to 25 cents per ton, depending upon conditions. The average price of pulverized limestone at the present time is:

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Southern	**3.40 " " " " " "**
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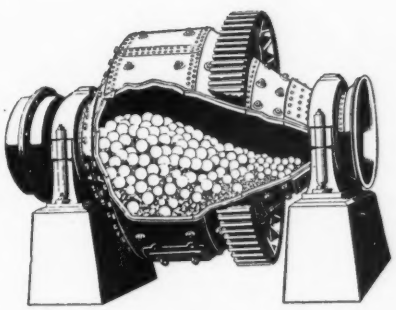

The country is badly in need of ground limestone. We have the equipment and engineering staff. If you have the limestone, let us get together—both of us will profit.

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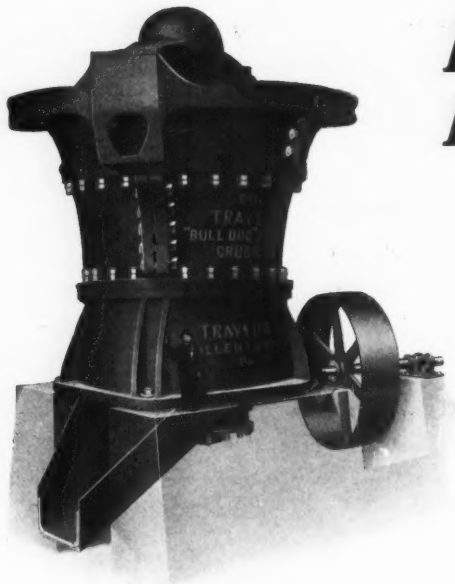


Built for Long and Faithful Service—

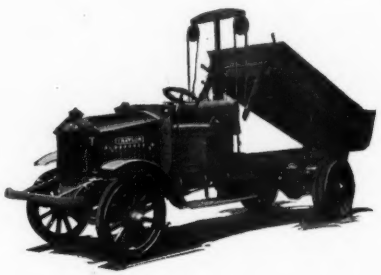
The Traylor "Bulldog" is always a producing force. It delivers the maximum utility at lowest cost.

This producing force and economy, plus the long and faithful service is predetermined in the design—in the Bend-Proof Shaft—the Hewes Spider—the Cut Steel Gears that run in oil—the perfect Force Feed lubricating system—and the careful attention to the details of manufacture that is a part of our organization.

Traylor Motor Trucks are built right to stay right. They are built to stand the hard service imposed upon trucks in the Rock Products Industry, and have the long life of traditional Traylor quality.

They come in a complete unit ready to go into immediate service.

Write for Bulletin RGX-1 on Crushers, and Complete Data on Our Motor Trucks.



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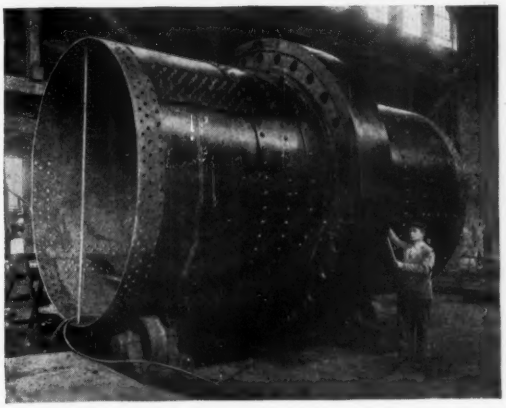

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VULCAN Kilns are built with due regard to distribution of weight and to take care of overload. The roller bearings and driving gear are constructed to protect them from the unfavorable conditions under which they operate. The tire construction is original with Vulcan and has given excellent results.

It has been said of VULCAN KILNS:

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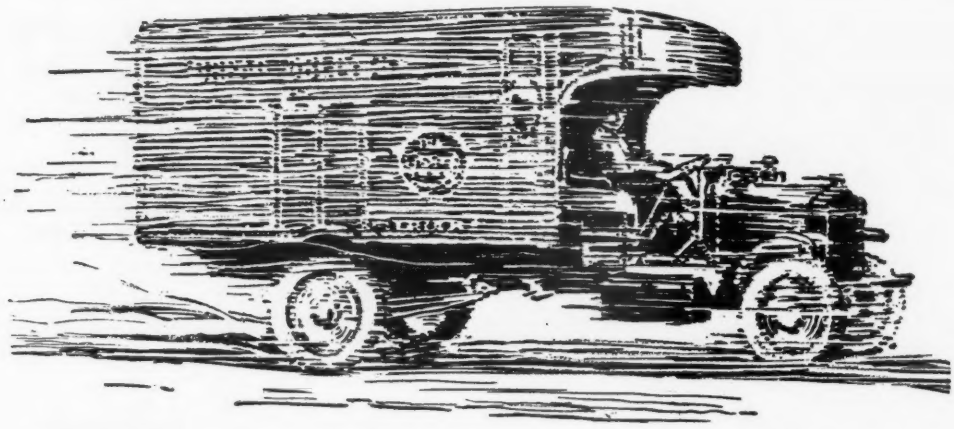

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It is a big advantage to owners to buy a modern up-to-date truck which embodies every recent improvement that truck engineering has developed. No change of design is introduced by Pierce-Arrow until proven in use.

Until war demands interfered, every improvement developed was introduced in current production. Experimentation went right on. Now these improvements are embodied in present Pierce-Arrows. They are the most efficient trucks made.

Pierce Arrow

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3½-ton 4950
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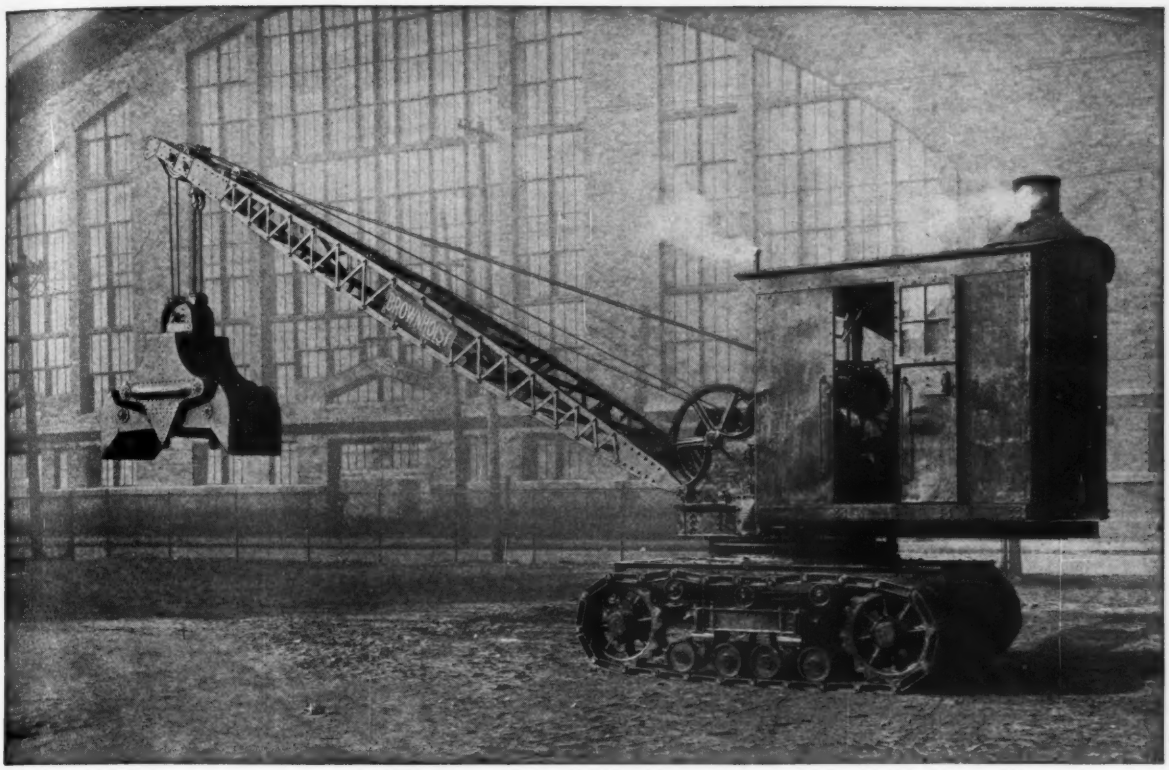
All Prices F.O.B. Buffalo

THE PIERCE-ARROW MOTOR CAR COMPANY, BUFFALO, N. Y.



Cut your handling costs

Have you ever taken time to figure up what it costs you to handle materials by hand? Or have you compared your hand handling costs with those of a user of a locomotive crane? Many concerns using Brownhoist locomotive cranes now wonder why they wasted labor for so long when a locomotive crane would do the work better and more economically.

After a Brownhoist locomotive crane is once used the owner seldom goes back to his old handling methods. He knows he has a machine he can depend on for all kinds of steady service. And he has found out that the crane is not only dependable but more economical than the labor which he used to think indispensable.

For handling bulk and heavy materials the Brownhoist is proving itself a time and money saver in many different lines of business. There are types and sizes of Brownhoists to fit into nearly every handling need. Our catalog K shows some of these cranes at work. May we send you a copy?

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Specializing in the design of modern Lime Calcining and Hydrating Plants.

Builders of the "Arnold" Lining for Vertical Lime Kilns.

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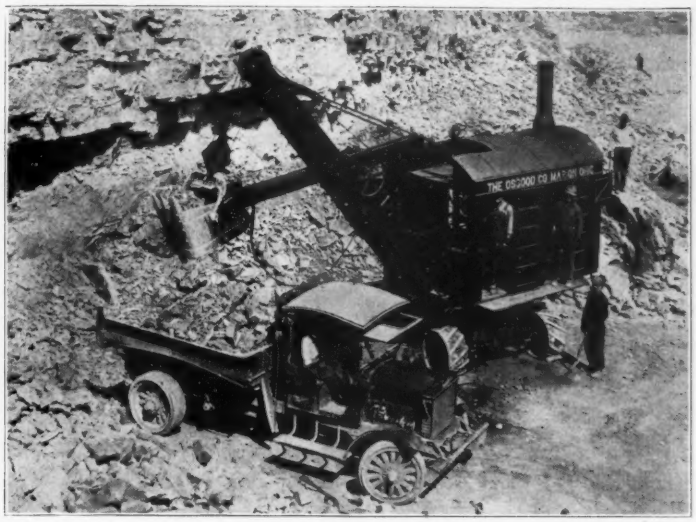


Osgood 18
Traction
Revolving
Steam Shovel
3-4 Cu. Yd.

The Best Shovel Investment

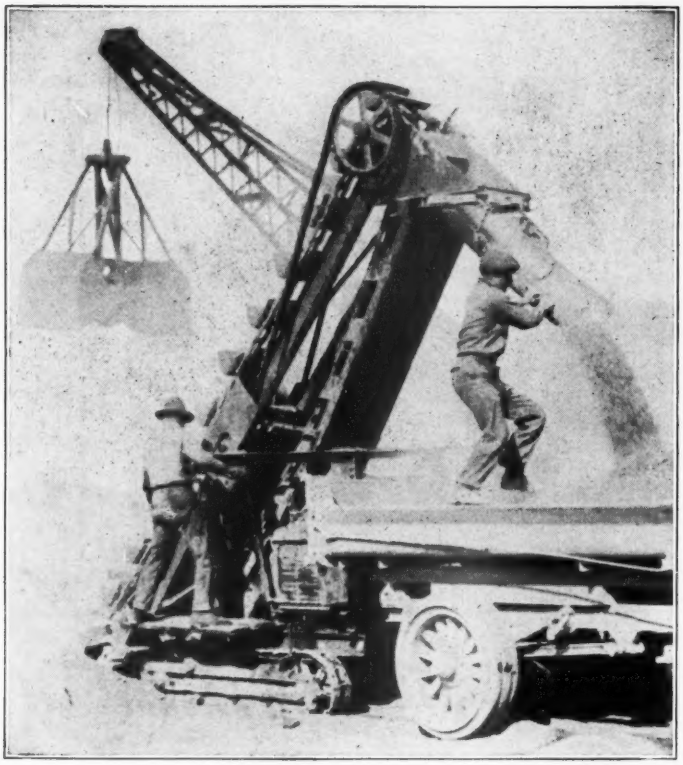
The greater value a Power Shovel may possess is neither power, nor capacity, nor economy; but the combination of all these elements, and the ability to *keep* them through long years of service.

Whether your requirements are large or small, the Osgood is the best shovel investment you can make. With it you buy the greatest amount of satisfaction in every way; and we will willingly help you solve your excavating problems in a way that will materially reduce yardage costs.

Revolving and Railroad Types, ¾ to 6 cubic yards.

The **OSGOOD** COMPANY
MARION, OHIO

OSGOOD



Load at Low Cost With a B-G Loader

Cars, wagons and trucks can be loaded quickly with B-G Loaders.

Above is shown a B-G Loader handling crushed lava rock at Twin Falls, Idaho. Rate 6 tons in 6 minutes. Mr. W. L. Johnson, Road Director of the Twin Falls Highway District says that in finer materials it will load more.

B-G Loaders are working in all types of gravel pits. Our engineers are ready to help solve your particular problems. Ask for booklet V. No obligation. Write today.

Barber-Greene Company

AURORA, ILLINOIS, U. S. A.

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Canadian Agents: Mussens Limited, Montreal, Winnipeg, Toronto, Vancouver

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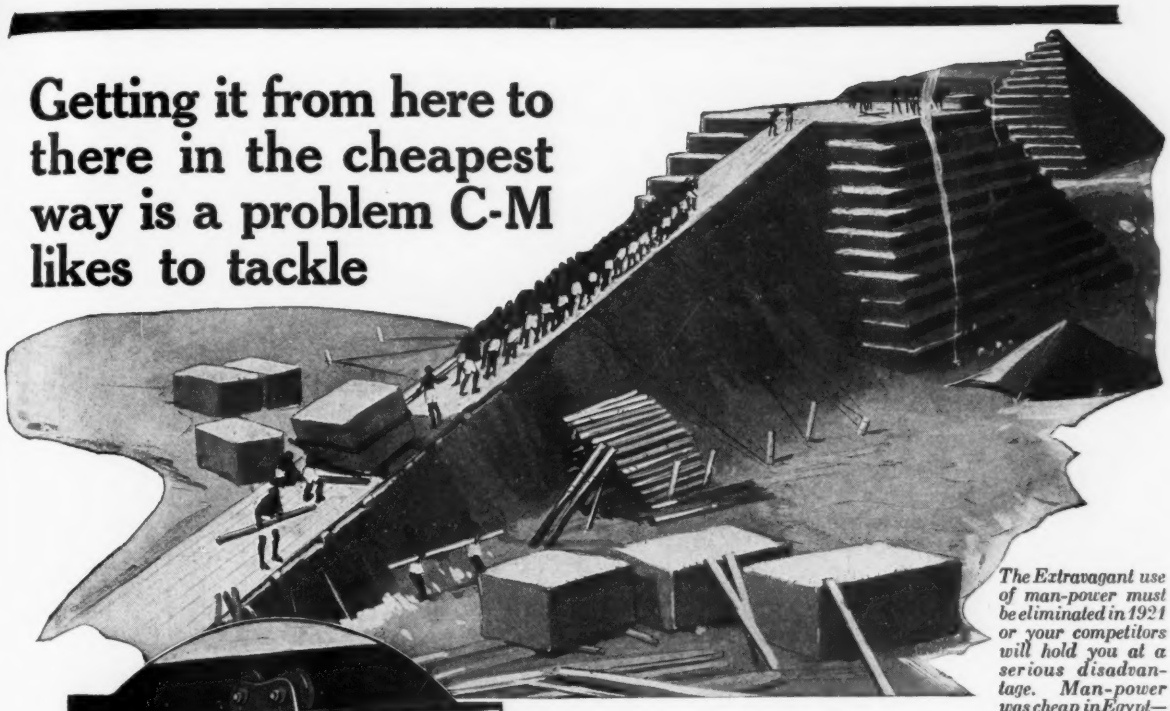
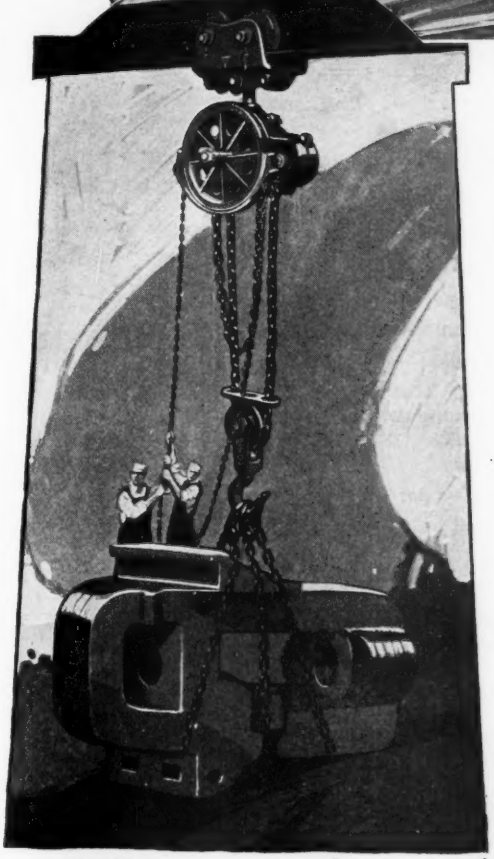
51 Chambers Street, New York City

Getting it from here to there in the cheapest way is a problem C-M likes to tackle



The Extravagant use of man-power must be eliminated in 1921 or your competitors will hold you at a serious disadvantage. Man-power was cheap in Egypt—it is dear in America.



CHISHOLM-MOORE installations of overhead trolley systems have made good in a big way over and over again in so many varied industries that we are always willing to risk our time and advice, and take our chance for an order when we have finished explaining our proposition.

If you have a job of lifting or moving that isn't being handled satisfactorily under present methods, we will investigate and report without obligation on your part. Just let us know that you are interested.

The Chisholm-Moore Mfg. Co.
Cleveland, O.

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Chisholm-Moore

"MARION" QUALITY is constantly and consistently upheld by the careful selection of all materials that enter into the construction of our shovels.

Manganese steel—with its wear resisting properties—comes in for liberal use wherever parts are subjected to sudden shocks, extreme vibration or excessive wear.

In the Model 36, maintenance costs are kept low and many costly delays eliminated by the use of manganese steel for the following parts:

Main Dipper Front Casting.
Dipper Teeth—either short or two-part.
Detachable Latch Plate.
Dipper Handle Racking.
Shipper Shaft Pinions.
Bevel Propelling Gears.

Steam shovel users prefer "Marions" for they know that *Marion quality* can be *trusted.*

THE Marion STEAM SHOVEL CO.

Established 1884 **Marion, Ohio**

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EVERYWHERE RELIABLE — THE Marion STEAM SHOVEL CO. — ESTABLISHED 1884

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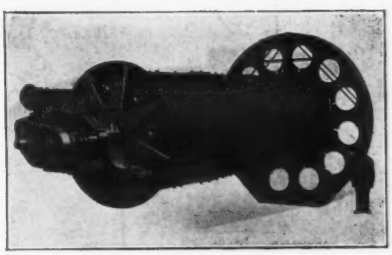
8′ x 125′ Lime Kilns, Producer Gas Fired



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COMPLETE LIME PLANTS

WE SPECIALIZE ON EQUIPMENT FOR THE PRODUCTION OF

AGRICULTURAL LIME AND LIMESTONE

ONE RESPONSIBILITY ASSURES SATISFACTORY OPERATION

ALLIS-CHALMERS

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BROWNING
LOCOMOTIVE CRANES

Lime and Limestone

—are most easily handled with a Browning Crane. A Browning Crane and Bucket with a 50-ft. boom, can load or clean out the far end of a car while standing on the same track.

For maintaining a ground storage surplus or for reclaiming material from waste piles, the unit-handling-cost with a Browning is much below that of any other method.

Wherever handling costs must be kept at an absolute minimum the built-in-ruggedness and faithful performance of Browning Cranes make a practical difference—measured in greater profits to the user.

Send for the Browning Catalog

THE BROWNING COMPANY
CLEVELAND, OHIO, U. S. A.

SALES OFFICES: New York, Chicago, Seattle, Portland, Salt Lake City, Birmingham, Los Angeles, San Francisco, Montreal, Washington, D. C.

This Browning Locomotive crane in addition to handling your coal, sand, gravel or other material will switch cars and when equipped with shovel attachment will make an excavation with an unusual height of lift.

The AMERICAN
Gasoline Locomotive

The leading American is Warren G. Harding, who made good at his home town, Marion, Ohio.

THE AMERICAN

Gasoline Locomotive is following in the footsteps of President Harding by making good in Marion, where it is installed in the Evans Stone Quarry, as shown in the accompanying illustration.

"Making Good" is characteristic of the American Gasoline Locomotive in stone quarries, gravel pits, coal mines, brick yards and in the construction field.

Their steadfast performance places them at the highest possible level of economical operation.

Our experts in transportation will gladly analyze the conditions under which the locomotive is to serve, then specify the particular size that will deliver the maximum utility at lowest cost.

The Hadfield-Penfield Steel Co.
BUCYRUS, OHIO
Locomotive Sales Department, 404 Hippodrome Building, Cleveland, Ohio

506 DAYS!

without an hour's interruption nor a dollar's expense for repair

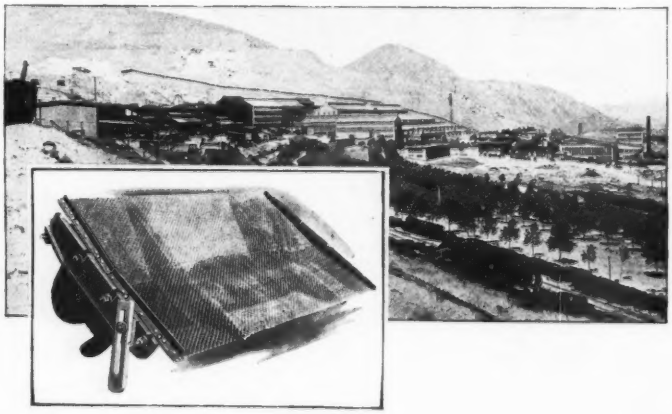
The Phenomenal Record of a Vibrator in a

MITCHELL ELECTRIC VIBRATING SCREEN

Here is the record of a Mitchell Screen Vibrator, summed up on the 506th day after the screen's installation.

1. It had run the full 506 days, 24 hours a day, without ever being taken from the frame—without even being stopped a moment for repairs.
2. It handled the following tonnage of ore in that time (operating in closed circuit with rolls):
   Total feed to screen (includes circulating load) 1,152,606 tons
   Total screen undersize (final product) ..... 594,027 tons
   Total screen oversize (circulating load) ..... 558,579 tons
3. In all that time and with that heavy tonnage it averaged only ½ h.p. per day.
4. Total screening cost per ton, including wire cloth, power and labor, less than one-tenth of a cent per ton!
5. The vibrator is still running—without having had a dollar spent on it for repairs.

Note particularly the achievement of handling more than a million tons of material at a cost of less than one-tenth of a cent per ton!



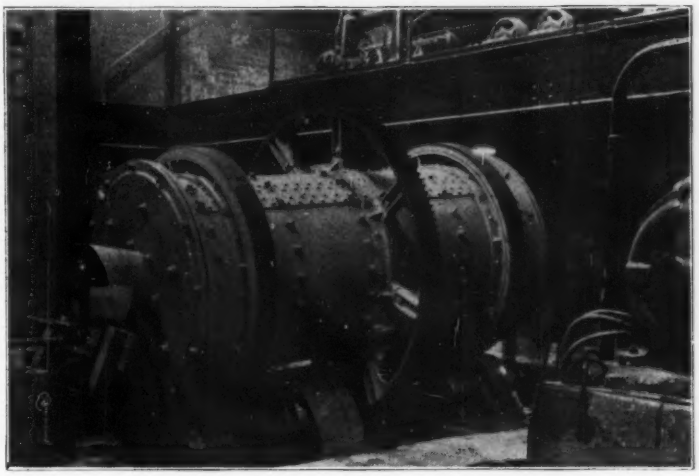
Look to the Mitchell to cut your costs and increase your screening tonnages. We'll be glad to go most thoroughly into any data you may submit and show you what you may expect from the Mitchell. Write us!

Stimpson Equipment Company

315 Felt Building **Salt Lake City**

MARATHON MILLS

For Grinding Pulverized Coal, Cement, Silica, Phosphate, Agricultural Limestone, etc.



This illustrates the installation at the Crume Brick Company's Plant, Dayton, Ohio. Latest Development for Sand-Lime Brick.

In the above plant this one Marathon Mill has more capacity and takes less Horse Power than the two largest sized Wet Pans it has replaced.

Sand-Lime Brick require intimate kneading, at which the Marathon excels, but only moderate grinding. But for extra heavy duty all mills fall down greatly in capacity when grinding hard and tough materials to the finest product like pulverized coal, cement, silica, phosphate, agricultural limestone or any other material to the finest mesh. The Marathon does not fall down one quarter as much in capacity per Horse Power as other mills.

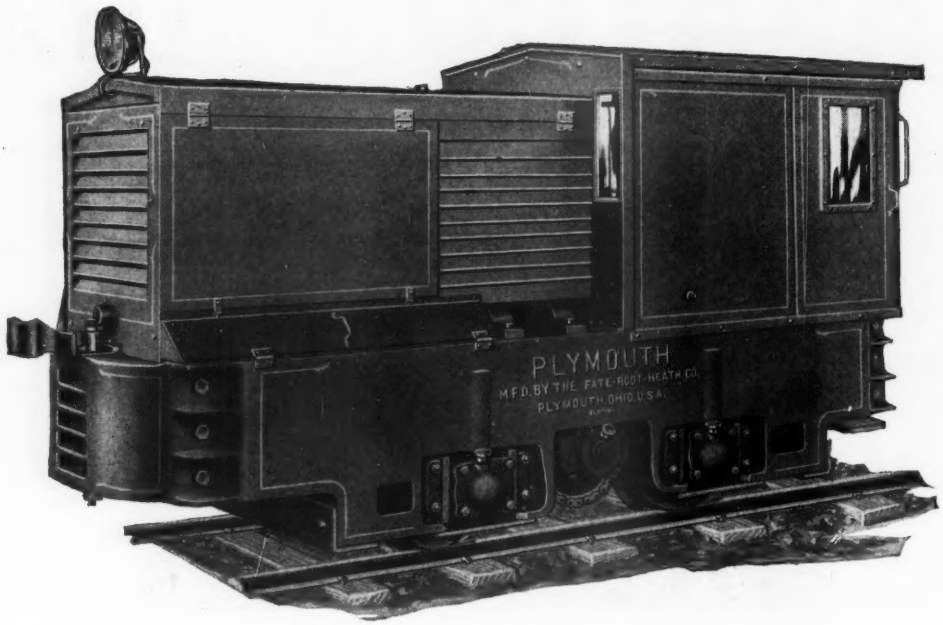
By the simplest adjustment it can even turn out the required finest mesh the first time through without separation, which no other mill can do.

Manufactured By

Marathon Mill & Machinery Works

General Offices

First National Bank Building Champaign, Illinois



The

STURDY PLYMOUTH GASOLINE LOCOMOTIVE

First in Service, First in Power, First in the Confidence of the Contractor

The Fate Root-Heath Co.

Plymouth, Ohio

Rock Products

Vol. XXIV Chicago, May 7, 1921 No. 10

Illinois Sand Plant with Original Operating Features

Burton H. Atwood's Interstate Sand and Gravel Company Plant Arranged to Insure "Cleanest" Material

THE INTERSTATE SAND AND GRAVEL CO.'s plant at Libertyville, Ill., built in 1913, while a comparatively old plant, has several new and unique features which have been added since the present owners took over the property in 1918. These new features include devices for washing belt conveyors, a two-speed feeder apron and washing screened gravel while in the bins and as it is chuted into the cars.

The plant is located near the edge of Libertyville, about 30 miles from the city of Chicago, and is between the North Shore Electric Railway and the Chicago, Milwaukee and St. Paul Railway. Both of these railways have side tracks to the plant, thus giving two shipping routes.

Pit Operation

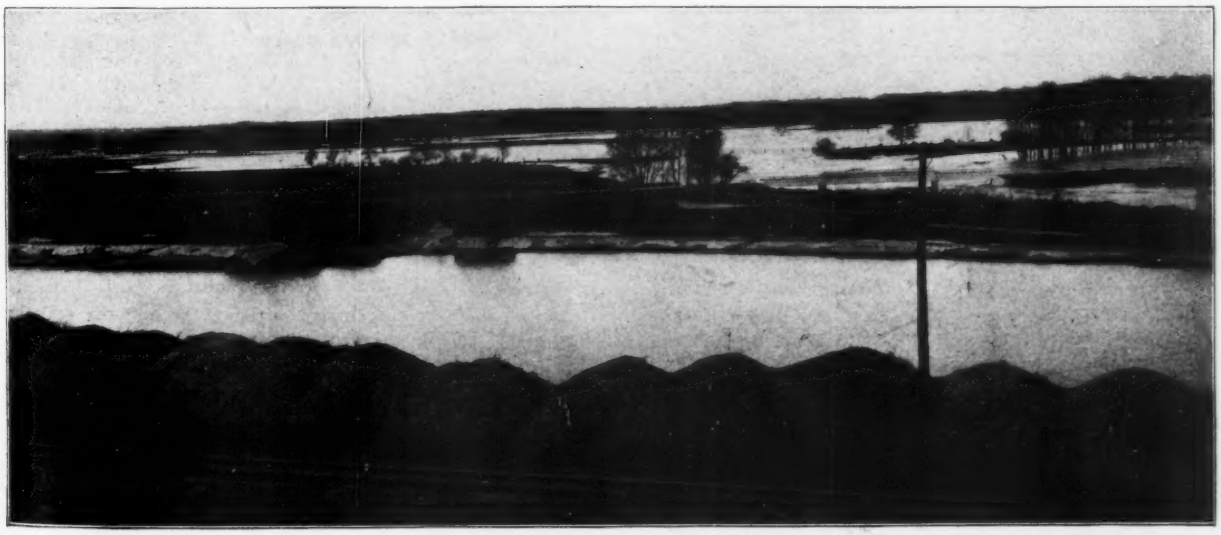
The excavation of the sand and gravel is handled by a dragline excavator on skids and rollers with a 2½-yd. bucket and a 60-ft. boom. Owing to the proximity of a river the excavation is always done under water of varying depths. The dragline is used for stripping and the soil stripped is dropped into the water behind the dragline. Sometimes the stripped soil is loaded on cars and sold, but the amount of soil stripped is so small that this practice is seldom followed.

The sand and gravel is loaded by the dragline on six standard-gauge cars of the Summers type. These are 50-ton capacity, center-dump, steel cars. The cars are taken to the loading hopper, two at a time, by a 40-ton, saddle-tank, 4-wheel drive steam locomotive. This locomotive is also used for switching cars during loading of the screened material.

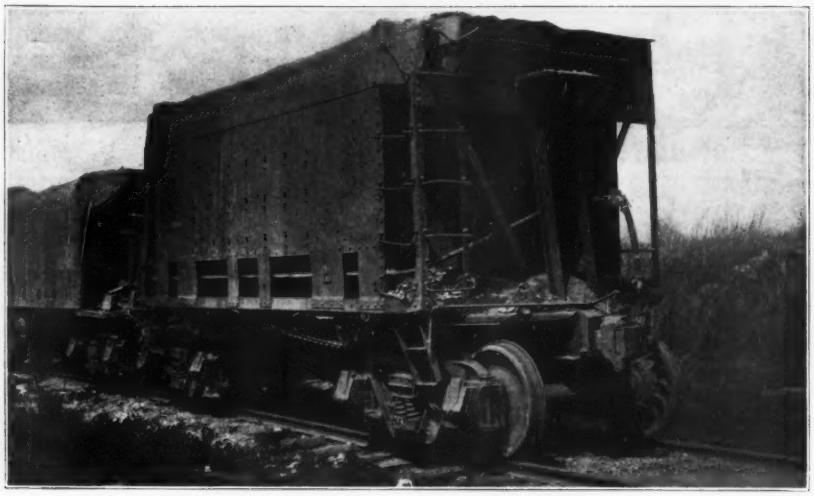
The Loading Hopper

The loading hopper is of wood construction and was built during the past winter. The railroad track comes up to the hopper on about a three per cent grade, and the rails extend on trestle work past the hopper, a distance of one car length. The hopper had to be set rather high in order to keep above the high water mark. Drainage of the pit under the hopper is accomplished by a small hand pump. Provisions for a third rail have been made on top of the hopper. The object of the third rail is to allow side dumping cars to be used instead of the center dumping cars and is for use in case of an emergency. The accompanying illustration shows this third rail layout and the use of a stub switch instead of a frog. A grizzly on top of the hopper allows all material smaller than a 7-in. stone to enter the hopper.

The feeder apron is 10 ft.x3 ft. and is set at about a 20-degree incline. In loading this feeder two openings are provided from the hopper. The advantage of the two openings is that in case of a delay in delivery of material to the hopper the reserve in the bin may be used through the second opening and a steady flow of material insured without waiting for the locomotive to bring more material. The hopper is a little too large to serve all its material to the feeder apron through only



General view of the pit—Interstate Sand and Gravel Co., Libertyville, Ill.—The general flood conditions are unusual



Standard gauge, steel, center dump car

Standard gauge locomotive and winter operating force

Dumping hopper with car ready to dump. Bin for road material returned from crushers

one opening. Both openings from the hopper may be opened or closed by means of gates.

The feeder apron is driven from the conveyor belt pulley by chain drive. The apron has two speeds, the fast speed is 27 ft. per min. and the slow speed 19 ft. per min. By means of this two-speed attachment extremely dirty material may be handled on slow speed thus insuring a thorough washing and relieving the necessity of regulating the opening from the hopper to the feeder apron.

Crushing Plant

From the hopper the material is taken by a 24-in. belt conveyor to the top of the crushing plant, where it is dumped into a 2¼-in. scalping screen 6 ft. long by 3 ft. diameter. The material failing to pass this screen is dumped into a bin directly underneath the screen and is chuted from this bin to either a No. 3 or a No. 5 gyratory crusher. Material passing through the screen is taken by belt conveyor to the screening plant.

The two crushers are located below the bin, one at each end as shown in the accompanying plant layout. In chuting the material into the crushers from the bin it is taken *over* the top of the crusher. By carrying the chute over the top of the crusher a better distribution of material in the crusher is obtained according to the plant superintendent. Each crusher is run by a separate electric motor; the No. 3 by a 25-h. p. and the No. 5 by a 30-h. p. motor.

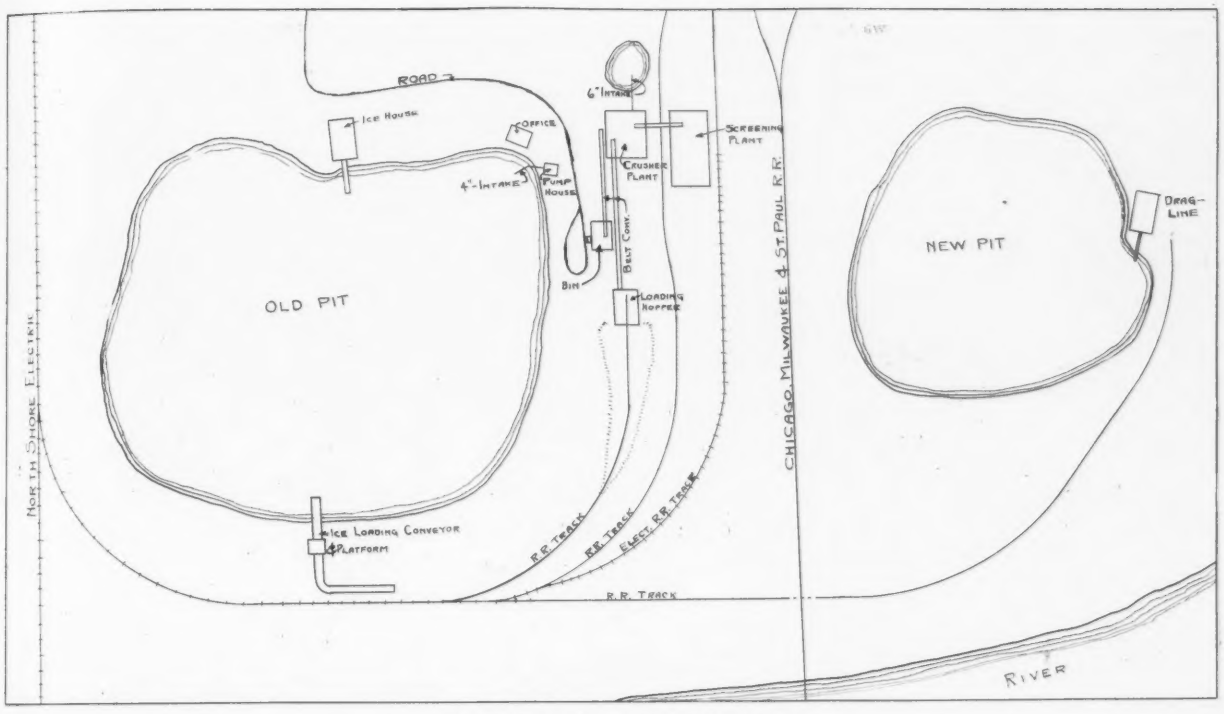
Crushed Material

From the crushers the stone is taken by a return belt conveyor to a point midway between the loading hopper and the crushing plant. It is dumped from the belt on a 1½-in. grizzly and all material not passing this grizzly is returned by the main belt conveyor to the scalping screen. Material passing the grizzly is either retained in a bin or may be deposited on the main conveyor and taken to the scalping screen. The material dumped into the bin is used for local roadwork, facilities being provided for truck and wagon loading from the bin.

The return belt conveyor is operated by a 15-h. p. motor while the main belt-conveyor and the screens are run by a 50-h. p. motor.

The Screening Plant

Material passing through the scalping screen is taken by a 24-in. belt conveyor to the screening plant where it is delivered to two rotary screens with 1½-in. perforations. The illustration shows the screen layout which is a typical system using Gilbert type screens. Material failing to pass these 1½-in. screens may be either deposited in bin No. 1 or chuted back to the crusher bin, being delivered there on the side near the small crusher. The material passing the 1½-in. screens



General plan showing plant layout

goes to two ¾-in. and one ½-in. screen. A baffle board set at an angle in the chute deflects part of the material to the center screen.

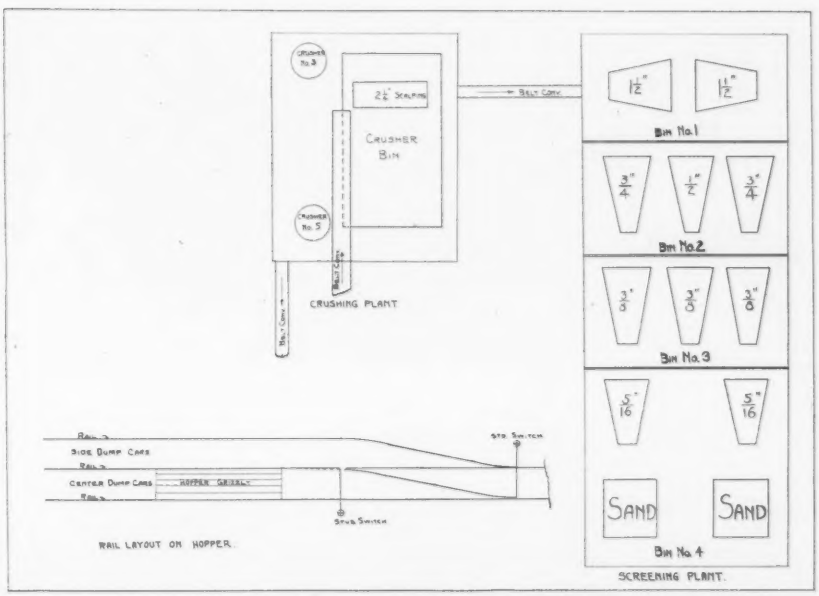
From these screens the material goes to three ⅜-in., then to two 5/16-in. screens, and finally to the sand-settling tanks. The sand-settling tanks are wood tanks with steel linings, and they automatically dump by tilting on an off-center shaft.

The water for washing the sand and gravel is supplied by two centrifugal pumps; a 4-in. for screening work, and a 6-in. for sprays and washing the gravel in the bins. The water is admitted on the material as it enters the 1½-in. screens. At first only the 6-in. pump was used, but it was unable to deliver the amount of water necessary so the 4-in. pump was added.

Variety of Grading Possible

The bins are located under the screens and are four in number. Small chutes convey the sand and gravel from the screens to the bins and are so arranged that a great range in grading of the gravel may be attained. Bin No. 1 may be used for one of the following grades; 1½ to 2¼-in; ½ to 1½-in.; ½ to 2¼-in.; ⅜ to 1½-in.; ⅜ to 2¼-in. Bin No. 2 may be used for the following grades: ⅜ to ¾-in.; ⅜ to ½-in.; ⅜ to 1½-in.; ½ to 1½-in. Bin No. 3 contains only roofing gravel, 5/16 to ⅜-in. Bin No. 4 contains only sand.

The bottoms of the small chutes leading from the screens to the bins are lined



Layout of rails on top of hopper. Plan of crusher and screening plant

with band-saw blades obtained from an old sawmill at a very low price. According to the superintendent these saw blades make a very satisfactory lining as they wear very smooth and last a long time.

Design of Bins

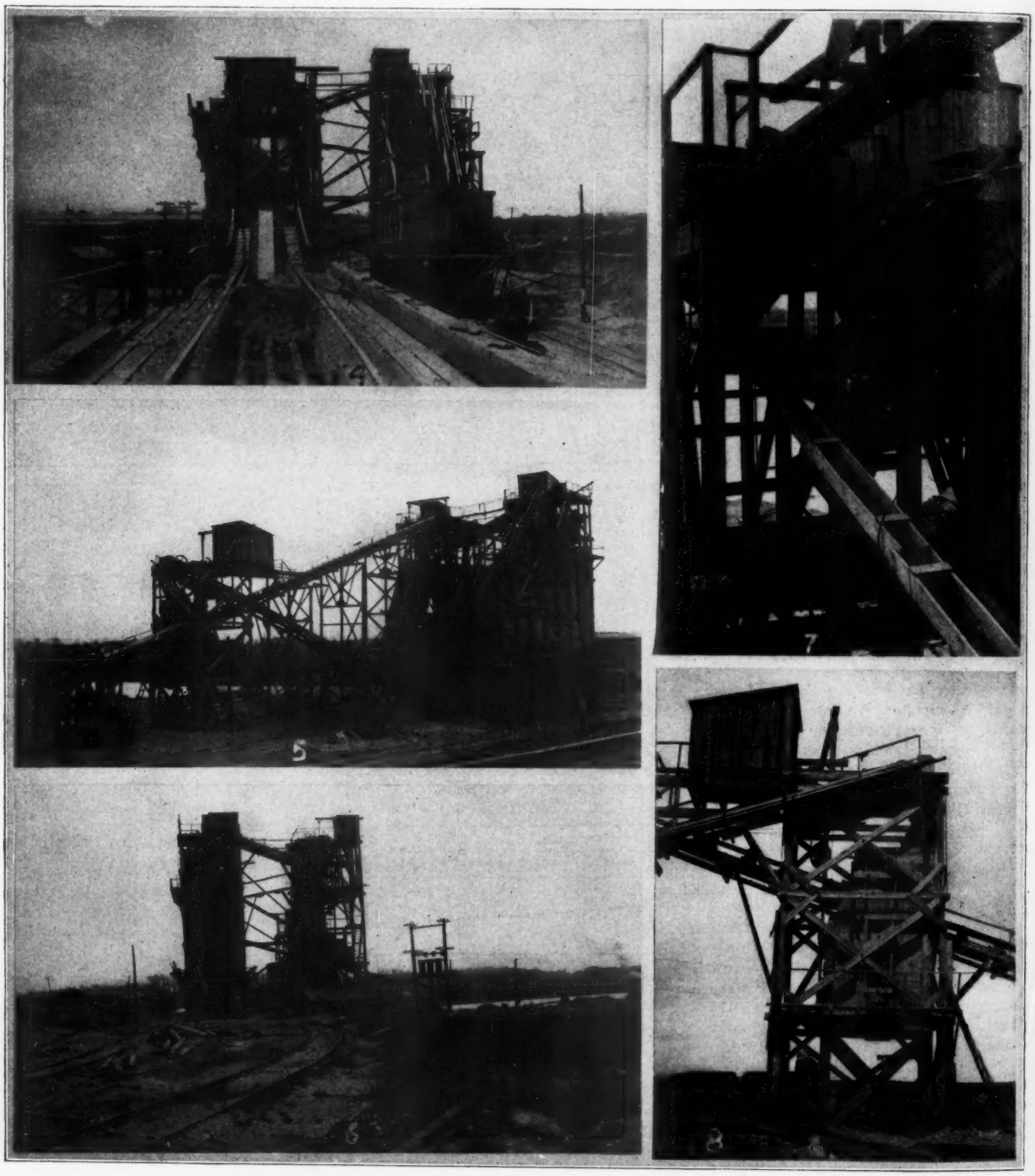
The bins for the washed and screened gravel are directly under the screens and are so designed as to permit their contents to be washed. The bottom of the bin rests on a fill and is made of 2x4-in. timbers with a perforated steel plate on top and boards on the bottom. The gravel rests on the steel plate and water sprayed on the top of the gravel will run through it and go through the small holes in the plate onto the boarded bottom which carries it to a trough located outside the bin.

Belt Washing Device

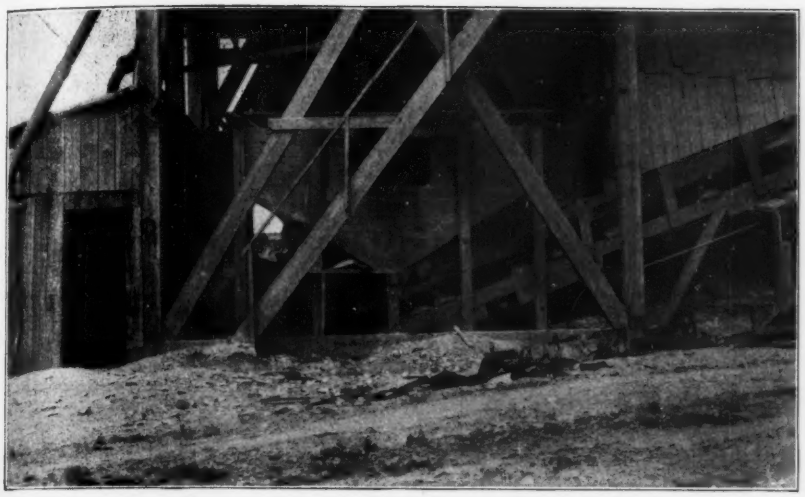
At the top of the crusher and screen-

ing plants are two belt washing sprays located close to the end pulley so that the washing operation occurs just after the belt dumps its load. This washing of the belt is accomplished by means of a 2-in. pipe, inserted under the belt, with holes drilled in it so that water coming from these holes is directed against the belt. The water washes off all the sand which sticks to the belt, thus preventing that material from being carried back. Under these sprays is a chute which conveys the water and material washed from the belts to the screens. No water is lost in this washing operation, it being merely directed against the belt before it is allowed to enter the screens.

These two sprays were put in primarily to prevent the "carry-back" of material, with its inevitable dropping off the belt, but in addition to this the wear on the belt has been much reduced thus increasing its period of service.



4—View from hopper showing bin for material returned from crushers, also chute to the main belt. 5-6—General views of plant. 7—Top of crushing plant showing scalping screen, also chute for carrying water from belt washing device to screening plant. 8—Bin for material returned from crushers



Crushers and receiving hopper. Return belt conveyor

View of screening plant from main belt conveyor

Loading for Shipment

The plant has loading tracks on each side of the bins, one track being electrically equipped with trolley wires by the North Shore Electric Railway. These tracks are graded so that cars may be easily moved by the use of pinch-bars without waiting for the locomotive.

In loading sand, gravel is used for plugging the small holes in the cars as straw has been found objectionable by several contractors. The loading chutes are about 14 ft. above the rail.

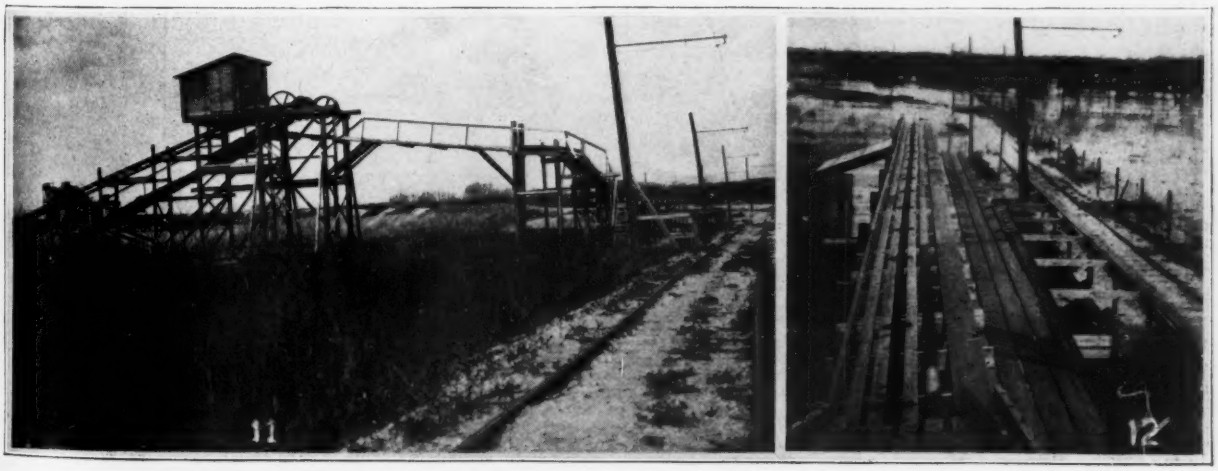
Ice Plant for Winter Work

In the winter time when the sand and gravel plant is closed ice is to be shipped from the old pit located close to the plant. The illustration shows the ice loading layout. This loading platform was built for about $2,000 and is estimated to be able to load 30 box cars per 10-hr. day. Space has been provided for adding another loading track if necessary.

Electric power is used throughout the plant being obtained from Waukegan and stepped down to 440 volts. A total of 165 h. p. is used. Burton H. Atwood is the president of the Interstate Sand and Gravel Co. and Chas. A. Adams is the plant superintendent. Mr. Adams designed and erected both the loading hopper and the ice loading plant.

Sand and Gravel Rate Reductions Urged

A DELEGATION FROM the National Sand and Gravel Association called on Chairman Clark, of the Interstate Commerce Commission, April 26, asking him to arrange for a conference between themselves and the railroad executives with a view to persuading the latter that a reduction in rates would revive road and house building. Chairman Clark gave them no encouragement. They wish to suggest to the railroad executives that they could stimulate business by a cutting of the Ex Parte No. 74 increases.—The Traffic World Washington Bureau.

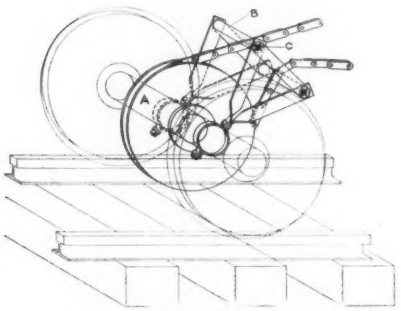


11—Ice loading plant; sand and gravel plant in the background. 12—Loading platform of ice plant

Hints and Helps for Superintendents

Device to Prevent Propelling Chains from Slipping

A VETERAN STEAM SHOVEL RUNNER, Fred Breman, 482 Church Street, Portland, Ore., has devised a propelling chain guide for standard railroad type shovels. This device has been tried out with considerable success in Oregon on a 45-ton Bucyrus shovel owned by the Utah Construction Co. It completely prevents the propelling chains from jumping off propelling sprockets when the shovel is making a sharp turn, and furthermore is very effective in preventing slipping over worn sprockets.



Steam-shovel safety device

As shown in the accompanying sketch, this guide is a simple frame, consisting of two collars mounted on each side of the propelling sprocket. These collars, together with the framework, are made from bar iron and pipe and bolted together. In the sketch it will be noted that the top lead of the propelling chain is tight and consequently the shovel is propelling ahead. When the shovel is moving back, the bottom chain, in tightening, lowers the guide automatically.

The details of construction are as follows:

The guide is constructed of two triangular side frames, held apart by distance pieces on which rollers run. The side frames are each made of three pieces of 2½-in.x¼-in. bar iron. Two of these pieces are twisted as shown in the sketch, to fit around the propelling shaft "A," and are bolted around the shaft with 2½-in. bolts. The guide is so constructed that it will turn easily around the propelling shaft. The distance from the center of the propelling shaft to the center of the rollers "B" is 24 in.

The rollers are made of 1½-in. pipe 10 in. long.

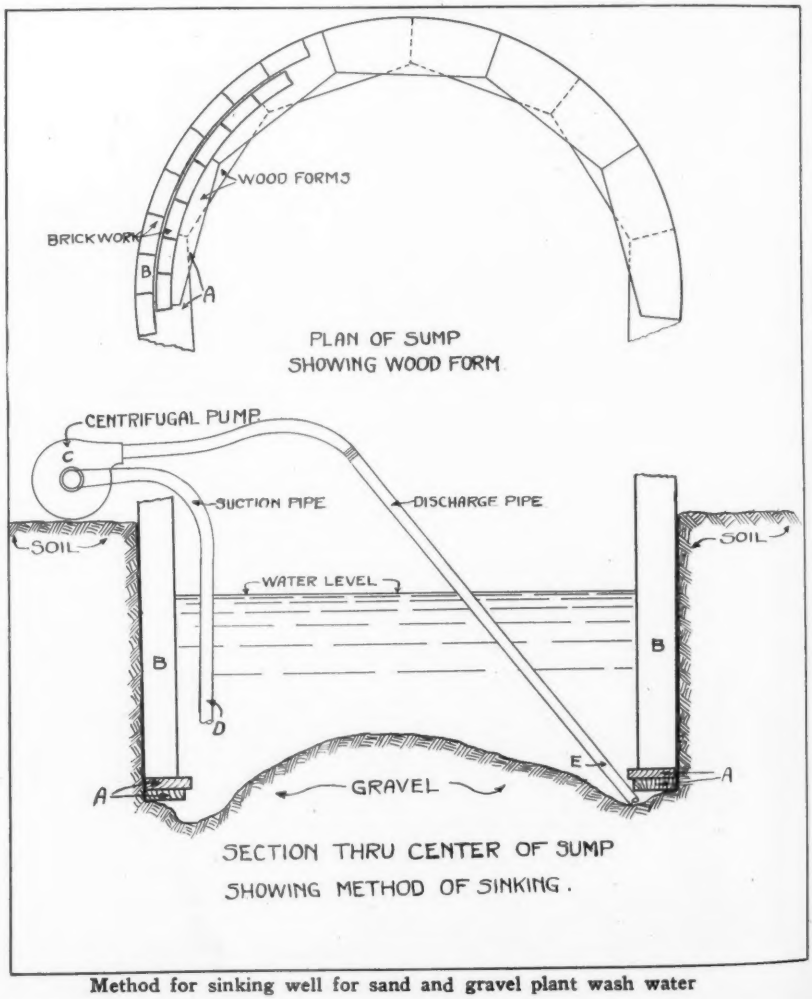
These rollers turn on distance pieces made of ¾-in. pipe 10¼ in. long. This gives the rollers a ⅛-in. clearance at either end. Two 13-in. bolts, "C," running through the distance pieces, bolt the side frames together.—"The Excavating Engineer."

Sinking a Brick Sump by Caisson Method

THE ACCOMPANYING ILLUSTRATION shows how M. C. Blanton, manager of the Morey Sand and Gravel Co., Eddyville, Iowa, used the caisson principle to sink a brick sump for the water supply of a gravel plant.

A wooden form was built strong enough to carry the brick wall without too much sagging. This form is shown roughly in the sketch since several different types might have been used. This form *A* was built and placed on the surface of the ground and the brickwork *B* started on top of it. Workmen caused this form to sink by digging the earth from underneath it with shovels—working on the inside of the form. The weight of the brickwork of course increased as the sump was built and caused it to sink. Care was taken to remove the earth on all sides at approximately the same rate causing a uniform settling and thus avoiding danger of cracking the brickwork.

Workmen were able to do this shoveling until the water became about three feet deep; then a hydraulic method of excavation was used. A centrifugal pump *C* was set up and at first was used to keep the water level down so that the workmen might be able to work inside the



Method for sinking well for sand and gravel plant wash water

sump. When the water entered faster than it could be pumped out and so high that the shovelers could no longer work, then the discharge line *E* was placed in the sump. By forcing the water under the bottom of the form through the discharge pipe the gravel was washed out and allowed the form to keep on sinking. The discharge pipe was kept moving around the bottom of the form to preserve a uniform settling of the sump. This was kept up until the sump had attained the depth desired (about 12 ft.) in order to give the desired water supply for washing gravel in the plant.

During the entire sinking operation the masons kept laying brick on top of the sump. The sump is a round one 15 ft. in diameter with an 8-in. brick wall.

Classification of Costs in Sand and Gravel Operations

A SAND AND GRAVEL OPERATOR'S ATTITUDE toward cost-keeping is much influenced by his previous business experience. The previous business experience of C. L. Ruffin, president and general manager of the Massaponax Sand and Gravel Co., Fredericksburg, Va., was in civil engineering and construction.

Consequently, Mr. Ruffin's analysis of the cost of a sand and gravel operation, presented at the recent Louisville Convention of the National Association of Sand and Gravel Producers, is a logical one from the point of view of operation. He said he had found it equally so from the point of view of accounting.

There are several objects in cost accounting and cost analysis besides the determination of the total unit cost. One of these is, of course, to compare the efficiency of various operations and for this purpose, Mr. Ruffin's form seems to be particularly well adapted. It is very simple. The outline below gives the essentials:

TESTING.
EXCAVATION—
- Wages, Crew,
- Wages, Groundmen,
- Fuel,
- Water,
- Lubricants,
- Repairs,
- Depreciation.

HAULING—
- Laying and Surfacing,
- Train, Crew,
- Train, Fuel,
- Train, Water,
- Lubricants,
- Locomotive repairs,
- Car repairs,
- Depreciation.

WASHING—
- Power,
- Wages,
- Repairs,
- Depreciation.

LOADING—
- Car preparation,
- Car loading.

ROYALTY AND DEPLETION.
SALES.
GENERAL (to be distributed to the proper account at end of period)—
SHOP MACHINERY AND TOOLS—
ADMINISTRATIVE—
MISCELLANEOUS—
- Rental,
- Insurance,
- Tax reserve,
- Automobile,
- Stores.

The overhead and administration expenses are carried out to the end of the operating season, and then to obtain the final unit costs of each step in the operation, these expenses are distributed under each of the main eight headings as the judgment of the man on the job dictates.

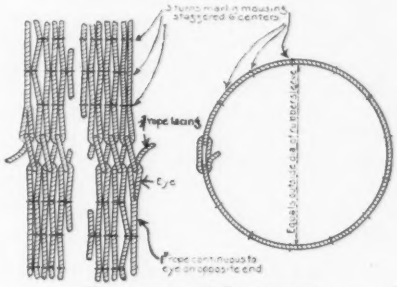
Rope Mat Reinforcement for Rubber Dredge Sleeves

VARIOUS METHODS of reinforcing the rubber sleeves on large-size hydraulic dredges have been tried at Portland, Ore., with the result that a rope mat reinforcement has been adopted. This reinforcement is described by J. H. Polhemus, general manager of the port of Portland, in a recent issue of the "Military Engineer."

This mat is made of old rope stretched over a rack and tied with rope yarn. The mat is then placed on the rubber sleeve and laced in place. The accompanying drawing clearly shows how the rope mat is made. Old rope makes a better mat than new rope, due to the fact that the stretch has been taken out.

The material handled by these dredges varies from coarse, heavy sharp sand to heavy gravel. The average harbor dredging conditions require a 3,500-ft. pipe line and 30-ft. lift from water surface to top of fill, the pipe line pressures running as high as 50 lb. per square inch.

Mr. Polhemus states that the average life of the 10-ply, 30-inch rubber sleeve, such as has been used by the port, served with rope mats, under average dredging conditions, is 300 working days. The average life of the same sleeve under like service without the mats is 150 working days. Hence, the life of the rubber pontoon pipe line sleeves has been doubled by



Rope mat reinforcement

the use of this simple and inexpensive rope mat. Also the wear and tear is much more severe on the large 30-in. dredges than on the 20-in. dredges, and the sleeves are subject to more accidents, making the rope mat protection the more necessary.

Use for Old Screens

A NEW YORK STATE crushing plant has found a rather novel use for old cylindrical screen plates. The illustration herewith tells the whole story. This is one of the upper Hudson limestone plants of the New York Trap Rock Co., New York City.

Use for old screen plates at crushing plant

Why Does Use of Agricultural Lime Increase So Slowly?

County Agricultural Agents All Over the United States Tell Rock Products How Producers Can Promote the Use of Lime and Limestone on the Farm

AGRICULTURAL EXPERTS tell us of the millions of tons of agricultural lime and limestone that *should be used* on the farms of America. Every producer sees the need of these materials on the farms around his plant. Yet the increase in the use of agricultural lime and limestone is a thing of very slow growth. Why?

In the hope of getting both an explanation and a suggestion or two ROCK PRODUCTS sent the following letter to county agents throughout the United States:

We would like a frank, honest opinion from you as to what agricultural lime and limestone producers can do to promote the use of these materials. Agricultural experts tell us there should be about 25,000,000 tons of these materials used annually on our sour soils. Only about 3,000,000 tons are actually being used.

You are close to the farmers. Doubtless you are fully aware of the value of lime and limestone on the soils of the greater part of this country. Why is it the use of agricultural lime and limestone increases so very, very slowly?

ROCK PRODUCTS is the business journal of the lime and limestone industries. What you tell us will be passed on to several thousand lime and limestone quarry men. Any helpful suggestions you can make will be in the interests of both agriculture and the limestone industry.

Please feel free to make any suggestions, criticisms or commendations of the methods used by lime and limestone producers that you want to, but out of them all—we are sending this letter to all county agents—we hope to have something really constructive and helpful all around.

The response was spontaneous and generous—the best proof possible of the interest of these county agents in the promotion of agricultural lime and limestone. There is a surprising unanimity of opinion that present freight rates are possibly doing more to hinder the use of these materials than any other one factor. Of course a great many think the prices of the commodities are too high.

That the real value of lime and limestone in agriculture is not generally appreciated is also the quite unanimous opinion. This being an admitted fact, it is obvious that neither county agents nor farmers are in a position to judge whether or not the price of the commodity really is too high. But of course they do recognize that both the price and the freight rate are out of line with the present farm value of agricultural products.

The New England States

In conservative old New England, lack of initiative and enterprise on the part of the farmers is a heavy handicap. As one county agent points out many farmers work intermittently in the shops and cities and are not wholly dependent on the product of their farms.

Another interesting point of view comes from Vermont, which illustrates the conservative attitude of even the county agent, who writes as follows: "The reason why the use of lime and limestone increases slowly is that the farmers are unable to see how they can get their money back by using it as much as we think they should, perhaps.

"I have run a lot of trials in this county and am still running them and proving to the farmers that lime about doubles the crop of clover, wheat, etc., That is fine and theoretically if **every** farmer would buy lime and put it on they would all double their crops and then this would cut the price of their product in two and as far as profit would be concerned, which they are all after, would be right where they were before. The farmers are pretty sure to work into the use of lime but they can't work into it faster than economic demands will take care of their increased crop."

Of course this is a spurious argument because instead of doubling his crop and cutting his profits in half the farmer would have to cultivate only half as much acreage as before for the *same crop* and get the same profit for half the labor. As a county agent in another part of the country aptly says the trouble with American farmers is that they are trying to spread their efforts over a large area poorly cultivated instead of concentrating their efforts on quantity and quality from smaller and more efficiently, as well as more easily, worked acreages.

Probably no section of the country has been more thoroughly worked by lime and limestone producers than New England, so it is rather discouraging to learn that even here lack of distributing facilities and lack of publicity are held to be among the prime causes hindering the greater use of lime and limestone. The excellent work of the eastern bureau of the National Lime Association is praised by a number of New England county agents.

Nevertheless, a county agent very close to a large lime manufacturing center writes thus: "I think the main reason why there is no more lime used is due to the fact that farmers are not familiar with its use. There are, in this county, several quarries from which the farmers are able to obtain the ground limestone, and also are able to obtain lime from the by-products which are left in the production of lime. The 'X Y Z Lime Co.' is situated so that it can furnish the farmers with a very good form of agricultural lime, but they do not use very much of it. I think, however, that as soon as they are able to obtain definite information on its use, they will begin to apply it on their land."

The fact that fertilizers are quite generally used in small quantities, bought at any convenient time, while lime cannot be bought at seemingly reasonable prices in small quantities, and generally cannot be had except at certain seasons, is another reason given for the failure of farmers to use more. Another point brought out is that it has not been the custom of lime producers to use the same intensive sales promotional work that fertilizer manufacturers do.

Another criticism of the business methods of lime manufacturers is this: "In my opinion, the farmers here feel that lime as a general thing is costing too much. Also, there is too much difference between "hydrated" and "land" lime. Our high freight rates encourage the use of high quality goods, yet this is impossible with present prices. Business methods employed by companies in this state are not of the best. With untiring efforts, I feel that I have succeeded in increasing the use of lime in this county some over 300 tons, as to any year previous."

Another writes: "I believe the best thing that can be done to increase the use of limestone would be to give the farmers' organizations the same prices as are given to dealers, in order that they may obtain lime products at a price which they can use them.

"After six years of strenuous work in promoting the use of limestone in this county, we find that the farmers' organizations although they buy much more

lime than a certain dealer in the county, have to pay a commission to this dealer on every ton they get. The result of this has probably reduced the amount of lime about two-thirds, as the farmers object to these cut-throat methods, and they can be called nothing else when the agricultural associations, that have promoted and encouraged and developed the lime trade in the county, are unable to purchase lime at the same price as dealers who have done absolutely nothing to promote its use.

"If you really wish to increase the use of lime, ordinary decent business methods to the purchasers will certainly help matters."

All considered a good summary of the New England situation is this: "More publicity is needed of the results of lime tests, especially those with local application. Practically every farmer in this county admits that he believes lime is well worth while, but, it's awfully hard for him to tackle something new which he has got on without, and of which dad never felt the need."

Middle Atlantic States

Probably nowhere else in the United States is the value of agricultural lime so generally appreciated as in the states of New York, Pennsylvania, New Jersey, Delaware and Maryland. High prices and high freight rates are held to be largely responsible for curtailing its use, but a confusion in the understanding of the various kinds of lime and their relative values is also a potent factor—as one Maryland county agent writes: "Better knowledge of the real value of the various forms of lime and also a knowledge of the significance of the calcium oxide content and the advisability of insisting on a statement of the calcium oxide content would give many farmers more confidence in purchasing lime and thereby result in the increased use of lime. Of course, a good quality of lime from all manufacturers would prevent disappointments and result in the increased use of lime."

The high *delivered price* of lime in New Jersey has caused the State Agricultural College to actually advise a restriction in its use. H. R. Cox, specialist in agronomy, writes as follows: "In response to your inquiry as to why farmers are not using more lime, I think that one very important reason is its cost delivered at the farm. When the cost of lime delivered comes down to about the same basis as the products sold by the farmer I shall expect to see an increase in the use of lime. In fact, when our opinion is asked by farmers as to the advisability of liming, we are cautioning them not to lime regularly and indiscriminately as has frequently been the custom in the past, but to lime only where there is a definite need for it."

Southern States

It is generally admitted by those who know best that no section of the United States needs agricultural lime and limestone more, and uses less in proportion to its need, than the Southern States. The reason is that Southern farmers, generally speaking, are not educated to a system of crop rotation in which clover and the legumes form so important a part. This is admirably summed up in the fewest possible words by an Alabama county agent as follows: "Get more clovers grown by the farmers, then lime will follow, as a necessity in many sections."

From Kentucky comes the following appeal: "I am sure that I would be very glad indeed if I could tell you just what to do in order to increase the use of agricultural limestone. In my opinion limestone is the one thing which a farmer should use and use plentifully."

In Virginia the farmers have been fairly well educated to the use of lime, but the farther south one goes, the lack of educational work becomes more apparent. Even where some lime promotional work has already been done, as in South Carolina, it has been misdirected, as explained by one county agent: "'God protect us from our friends, we can take care of our enemies.' This quotation is perhaps not verbatim; but expresses what in my mind is the main reason that the use of lime has not spread more rapidly than it has.

"Those who have been pushing the sale of agricultural lime have made claims that are altogether too extravagant. Farmers have listened to them and have not seen results.

"We all agree that there is great need that the use of lime be increased, but it must be used in its proper place and under the proper crops to show results. The farmer is a 'show-me' man and he has got to see with his eye the improvements before he will re-invest. This can be done under legumes, etc., and farmers should be advised to use it where they can see the results. Of course other crops can be aided with lime, but this 'show-me' thing is the way to get the farmer.

"These criticisms are in the friendliest of spirit and I hope you will take them as such."

A county agent in Georgia who is also a farmer himself gives the following encouraging report: "I am aware of the fact that 90 per cent of Georgia farm land needs lime, and I have been trying to induce farmers in this county to curtail the use of so much commercial fertilizer and, instead, lime their farm lands and plant this land to legume crops—and then watch results. I operate a 20-horse farm. A lot of this farm is in pasture, and sheep and other stock seem to thrive better where lime has been used. I am growing alfalfa, as fine as that grown in the West, by the use of 4 to 5 tons of limestone per acre. I believe that we will some day prove to the world that our deep loamy soil properly limed will be the alfalfa section of the country."

In many parts of Florida the soils are highly calcareous and no lime is really needed.

Central West

Ohio, Indiana and Illinois have been pretty well educated in the use of limestone but not lime. This is a limestone section where quarries are well distributed and long hauls, relatively speaking, are uncommon. Nevertheless high freight rates are the most important factor preventing increased use of agricultural limestone by the farmers. Also this is part of the "corn belt" where the recession of prices for agricultural products is most keenly felt.

An Ohio county agent, located in a city which is the very heart of the limestone quarry industry writes: "The majority of farmers do things as a matter of habit and it takes some time to establish new habits. The lack of capital is one of the important factors and many men feel that from $5 to $15 per acre is a rather large cash outlay for ground limestone. The lack of an available supply within hauling distance and the lack of an available supply throughout the year so that it can be hauled during off seasons and on return loads is an important factor. Lack of information regarding the value of limestone on the part of a large percentage of the farmers is another factor. Many men realize this value but it has not been brought before them forcibly enough to cause them to get into action and use limestone.

"High freight rates have been almost prohibitive particularly where there is a long haul required when the stone leaves the railway station. The high price of the product at present time in comparison with prices of farm produce is a big factor. The seeming independence on the part of the limestone producers and dealers regarding the use of their product is another factor which is prohibiting the use of limestone. A great many limestone producers are like too many other men, they are interested too much in the present dollar and not enough in the future of their business; and when there is a large demand for road stone or when the stone can be used otherwise—many of them are producing both types of stone—they are not interested in giving the right kind of service in the way of furnishing agricultural limestone.

"On a great many soils limestone will pay great returns when applied in the proper amount. But it does not give large returns on account of many difficulties in securing and applying the stone and in many sections of the country. The problem will have to be worked out rather systematically and we must have the co-operation both of the producers of stone and the educational forces and everybody that is interested in the use of limestone to put the work across in the right manner."

The state leader in county advisory work

in Illinois, George N. Coffey, writes as follows:

"The increase in the price of limestone and the large increase in freight rates, has tended to discourage the use of limestone among the farmers, especially since there has been such a large decrease in the price of farm products. If it were possible for the farmer to secure limestone at no larger increase over pre-war cost than the present price of farm products, I am sure that there would be a tremendous increase in its use in this state, particuarly in Southern Illinois."

Just to show how price is a relative consideration the following from an Illinois county agent is very illuminating: "The Peoria County farmers need to use a large amount of agricultural limestone. In fact, the use is in its infancy. There would be a great deal more limestone used if it were possible to receive the limestone when it is needed. The last few years, the transportation question has been very serious. Another item which prevents the use of a large amount of limestone is the excessive freight rate. Five years ago we used to be able to lay limestone down in Peoria at $1 per ton, and at a large number of our stations. Today the quotations on limestone plus freight will be upwards of $3 per ton. This is a prohibitive price when compared with the price of farm commodities.

Thus $3 a ton is looked upon as a *prohibitive price* for the material *plus,* the freight, in Illinois. Farther east farmers would not buy a material so cheap, feeling that a commodity so lightly valued by the seller could not possibly be worth *anything!* Obviously, while Illinois and the Central West generally has been fairly well educated in the *use* of limestone, it has not been educated in the *value* of limestone.

West of the Mississippi

The need of lime on some of the soils in the Central West States west of the Mississippi River is only just beginning to be felt. Unquestionably another generation of farmers in this section will be large users of agricultural lime and limestone. Educational work has already been begun by county agents as far west as Nebraska.

In a section of the country like this where the need of agricultural lime or limestone is not so pronounced as in the East great care must be taken by the promoters not to recommend liming under any and all conditions. By doing so many farmers who look only for immediate results will become prejudiced and more harm than good will be done the limestone industry.

One Missouri county agent, who is frankly in favor of greatly extending the use of agricultural limestone, makes this point clear in the following: "The use of limestone in some form or other is fundamental in the best systems of soil improvement. The need of lime varies so greatly in different counties and even at different states and this fact makes it a little difficult to stimulate the use of limestone. Many farmers use it where the need is not very great and the results obtained are not very striking. I have been doing agricultural extension work and county agent work for the past eight or nine years and during this time I have seen some remarkable results from the use of limestone and others not so remarkable."

The problem of properly educating farmers to the use of agricultural lime or limestone is admirably summed up by Prof. P. F. Schowerngerdt, of the University of Missouri, as follows: "We are now conducting a liming campaign in Missouri, because we consider that the use of lime is fundamental to most any system of soil improvement. We are, however, making our recommendations along rather conservative lines because as we come in contact with farmers we find that it is a real problem for a land-owner to lime any considerable acreage under present economic conditions and receive a large return, except as the proposition is continued over a long period of years. This is the point that makes a good many farmers drop the idea of liming. They are looking for something that will give them more immediate returns, and it will require a good deal of educational work to make men see the importance of getting at the fundamental problems, rather than trying to use something that will give more immediate returns but still not solve the fundamental problems."

Northwest States

Wisconsin is the only state in the Northwest group that has developed any considerable production and use of agricultural lime or limestone. It seems certain that Minnesota, Iowa and the eastern parts of the Dakotas need lime on their soils almost as much as Wisconsin. The increasing use of agricultural lime and limestone in Wisconsin is due almost wholly to efforts of a few progressive producers.

The need of lime or limestone is being experienced in eastern Minnesota. One county agent writes: "We have demonstrated on the sand land in this county that limestone will bring an increase of from 100 to 250 per cent on alfalfa and clover, and yet all farmers in that particular area are using little or no limestone. Cheaper prices, cheaper freight rates, easier methods of applying and more demonstrations are the things that I feel are needed to increase the use of agricultural lime or limestone."

Another Minnesota county agent gives the following encouragement: "In my opinion there should be far more general use of pulverized limestone even on many soils that are not sour. The limestone has a distinct effect on stirring clay soils and is an effective repellent of insect pests that stay in the ground. Probably the reason why the use of agricultural limestone and lime increases so slowly is the fact that the farmers do not realize the cheapness of the pulverized limestone for agricultural purposes."

Acid soils are beginning to make an appearance in the Dakotas. A county agent states: "I am convinced from experiences which I had in testing soils for acidity while with the Agronomy Department of the State College of South Dakota that there are large areas of acid and near acid soils in southeastern and western South Dakota. Most parts of South Dakota will have to be considered rather new farming areas and the present generation of farmers are not educated to the necessity of applying any sort of mineral to the soil.

"I believe it is a matter of education and as soon as soil acidity is recognized as a problem in any county the Farm Bureau will adopt it as one of a number of county projects and carry on demonstrational and educational work to prove the benefits of applying agricultural lime. It would be well for you to keep in touch with the Farm Bureaus and especially those that in the future will recognize soil acidity as a county project."

In the Rocky Mountain States, of course, little or no lime is needed. As a matter of fact many soils have an excess of lime or gypsum for some crops. But this is the best alfalfa land in the country—the irrigated sections of Montana, Utah, Colorado, Arizona and New Mexico.

West Coast States

Easterners think their section of the country is educated to using lime or limestone in agriculture. What will they think of the practice in some parts of California, as outlined in the following letter from the assistant state leader of farm advisors in the coast counties:

"I have been working in the soil survey for the federal government and state of California for about 12 years or more and have had an excellent opportunity to view the requirements of the different regions for lime. I fully agree with you that only a very small amount of this needed constituent is used on the farms of the country each year.

"In California we need many train loads of this material annually to meet the needs of the soils in the different sections of the state, but at present the failure to use more lime apparently is due to a lack of information regarding its value and also to the high price of the product. Ground limestone is the form used here most generally and retails to the farmer at prices from $6 to $10 per ton. Many areas have a lime requirement of 10 to 20 tons or more per acre and naturally the price is a very important factor in meeting this need.

"We have been prospecting the state more or less in recent years for lime deposits and attempting to work out some plan for obtaining cheaper supplies, but

as yet no well organized plan has been put through.

"In many places of this state where the soils are strongly acid we have obtained greatly varying effects from the use of lime, in many instances no favorable results showing at all. This has been a puzzle to us from our knowledge of the relation of lime to such soil conditions. In the last two years, however, we have been conducting a series of test plots in different locations and have found that on the same soil in comparative tests that lime would give no results to leguminous crops, while gypsum would give an increase of about 30 per cent, sulphur about 60 to 75 per cent and superphosphate about 40 to 50 per cent. When lime and sulphur, however, were used in combination we obtained an increased yield considerably over 100 per cent in many places the first year, and this increase continued to grow the second and third years. These results indicate that in certain instances there appears to be some inhibiting agents in certain of our acid soils which prevent lime from functioning properly and sulphur apparently remedies this condition.

"One of our major projects still in this state is to educate farmers to a greater use of lime and we intend to continue this campaign until the needs for this constituent have been met. As mentioned above, I believe if we are able to obtain the material at a greatly reduced price and by conducting a large series of well distributed plot tests to show the benefits of its use that we will be able to greatly increase its use.

"We have the same experience in the use of commercial fertilizers and other soil products here and find that the farmers even after many years of use of these products still are very uncertain as to their value and as to the proper amount required for the different crops and soil conditions. In fact, it appears to me that we have merely begun in soil knowledge and our greatest problem in the future to put these things across is for investigators to get closer to practice and assist in putting the results of their studies into actual practice. Farmers do not take up information obtained by investigational work readily, even though it is apparently genuine and I am confident that a closer touch with farmers in educating them as to the value of improving practices along these lines would result in a much broader use of such material."

Michigan Public Utility Commission Reduces Freight Rates on Sand, Gravel and Crushed Stone

ON APRIL 23, the Michigan Public Utility Commission ordered a 25 per cent reduction in the southern half of the state, and a 23 per cent reduction in the northern half, in freight rates on sand, gravel and crushed stone used in road and building work. The order does not affect present rates on glass sand, foundry sand, flux stone, agricultural limestone, etc.

The case was prepared for the county highway authorities and producers by George J. Bolender, manager of the traffic bureau of the Kalamazoo Chamber of Commerce, who estimates that this reduction will save the State of Michigan $625,000 annually on roadwork alone.

In summarizing his case on March 31, 1921, Mr. Bolender said:

"The railroads insisted, when the sand and gravel rate situation was first brought to their attention that they were in sympathy with any movement which would tend to increase their tonnage without material loss of revenue and greatly resented the idea of action before this Commission, when that action was proposed by the Board of Road Commissioners of Kent County.

"On invitation of this Commission, the County Road Commissioners and State Highway Department acceded to the request of the railroads to go into conference with the view of arriving at the proper solution of this question and the only result of the various conferences was to confirm the previously held opinion of the Road Commissioners that there was no hope of securing a satisfactory rate adjustment from the Michigan railroads without affirmative action by this Commission.

"The line of reasoning being pursued by these railroads seems to be that a certain amount of sand and gravel will necessarily move regardless of the level of the freight rates and that it may be more profitable to haul this limited quantity at the excessive freight rates now in effect than to haul considerably more in

George J. Bolender

quantity at a somewhat less rate per unit. *This line of reasoning ignores absolutely the right of the taxpayer to have his property hauled at just and reasonable rates.* It is a line of reasoning which can only result in much smaller than normal movement of this class of traffic, with consequent lack of revenue for the railroads and will cause them to store many thousands of cars this summer, which could otherwise be used for profit. It will also cause much lack of employment, as according to the record of this case, many road-building projects will be abandoned until a more favorable season.

"In view of all this the County Boards of Road Commissioners here represented, respectfully ask that this Commission immediately order such reduction in these freight rates as the Commission may find proper and respectfully urge that such reduction be made effective at the earliest possible moment in order to facilitate the building of numerous highways which are badly needed and which to be completed this year, must be begun at once."

Pittsburgh Sand and Gravel Markets

THE DIFFERENT sand and gravel producers in the Pittsburgh, Pa., district are entering upon an active spring season, and there is a good prevailing call, with healthy tone to the trade. The Rogers Sand Co. has been active in the vicinity of Ambridge, and has used its towboat, "Early Bird", for hauling many flats of gravel from this point. The Keystone Sand & Supply Co. is operating its sand and gravel properties in the vicinity of Coraopolis, and has been plying actively with its towboat, "Victory", to and from this section. The company has also operated considerably of late in the Neville Island district. The Iron City Sand Co. is keeping its towboats busy with sand and gravel flats to Pittsburgh. The different diggers are not losing any time and general production is on the increase.

Canadian Road Congress

A. P. SANDLES, secretary of the National Crushed Stone Association and of the Ohio Macadam Association, will address the Canadian Good Roads Congress to be held in Halifax, Nova Scotia, on May 10, 11, 12, 1921. This will be the Eighth Annual Convention of the Congress.

Who Wants to Make a Million Dollars or So in Lime?

Chance for Party with Capital Enough for Big National Advertising Campaign—Lime in One, Five and Ten-Pound, Air-Proof Packages

A MIGHTY GOOD BUSINESS MAN once told the editor that he would bet any amount of money that he could sell, at a profit, horse dung, put up in glass jars, if sufficient capital was provided for the right kind of an advertising campaign. His argument was that you could sell anything you once convinced the public it needed for some purpose or other—and convince the good people you could, *en masse,* if you set about it in the right way.

It is said the girls of New York City (14 to 85 years old) require about four tons of talc a day to powder their noses, and other parts of their anatomies. If you take a pencil and paper and do a little figuring you will see that this is really a conservative estimate. But look at the money spent for advertising!

There are historic examples of cereals, and indeed many staples like flour, creosote oil under one name or another, soap, and what not, through the national advertising of which huge individual fortunes have been made.

When these things have been done and are being done with commodities or articles that have only one use, or may even be useless in the last analysis, it takes some stretch of the imagination to conceive what might be done with a commodity like *lime.*

Now as to Lime

We quote below from no less an authority than the National Lime Association's March "Construction Lime News" a few of the household uses of lime. These are by no means all the household uses of lime because it is doubtful if any living person knows all the uses at this time. The field is almost limitless:

Lime, either lump or hydrate, has many uses around the house other than in mortar, plaster, stucco, or concrete. It has been used as a deodorant and disinfectant for centuries. There are references in the Bible wherein lime and whitewash are specified for purifying the home after plague. Many ancient writers recommended that quicklime be spread over areas which had a tendency to become foul.

Frequently cellars are damp and musty, especially during the winter when it is too cold to open windows and doors for proper ventilation. The musty odor and dampness may be overcome by placing about a peck of quicklime in a metal box in the cellar and a few lumps in out-of-the-way places. The lime will absorb the moisture from the atmosphere and thus prevent the formation of mold and its consequent bad odor.

Kitchen Uses of Lime

The housewife will do well to keep some hydrated lime at hand, and sprinkle it around the sink or washtub occasionally. It will keep down odors, dry up moisture, and discourage vermin, such as ants or roaches. A lump or two placed in the refrigerator will aid materially in keeping it fresh and sweet.

A very simple and effective scouring paste may be made by mixing household ammonia and hydrated lime to a thick paste. This is suitable for polishing aluminum, zinc, and other metal kitchen utensils. A mixture composed of one part of soap powder, two parts hydrated lime, and enough household ammonia to make a thick paste will be found very effective in removing grease that has been burned on cooking utensils. Smear the paste on the place to be cleaned, allow it to stand a few moments, and then rub vigorously with a damp rag.

Flies and their attendant evils may be overcome to a large extent by sprinkling either lump or hydrated lime in and around the garbage container.

Whitewash for the Home

Whitewash is of a value both as a disinfectant, and also because of its color. It acts as a preservative for wooden structures, and if properly prepared is a fire retardant. A dark and gloomy cellar may be made bright and clean by the use of whitewash. Cellar steps, beams, and other obstacles which frequently cause trouble should be covered with whitewash, which will serve to call them to attention, thus avoiding accidents. On small buildings about the lot as well as trees and fence posts, whitewash can be used to advantage as a means of improving their appearance, and also to some extent reducing attacks from vermin. The National Lime Association has prepared an interesting bulletin on the subject of whitewash, which will be sent free upon request.

Many householders have difficulty in the fall with their furnaces because the grate bars have rusted. This difficulty may be avoided, if when the fire has finally gone out in the spring, the bars are cleaned and a peck of lump lime placed thereon. A like amount should be placed in the ash pan. As lime has a greater affinity for the moisture than has iron, rust is prevented by its use.

Uses of Limewater

Limewater, which has many uses, may be easily prepared at home. Boil some water for 20 or 30 minutes and then allow it to cool to about blood heat. Into a quart of this water drop a piece of fresh lump lime about the size of an orange. Let the vessel stand until all boiling and bubbling has ceased and the residue settled. Then pour off the clear solution into a clean bottle for future use. This limewater is particularly suitable for growing children, as it aids in supplying the calcium needed in the bones and teeth.

Eggs may be preserved in an effective and economical manner at home by using limewater. Dissolve two or three pounds of lump lime in five gallons of water which has been previously boiled and allowed to cool. Allow the mixture to stand until the lime has settled and then pour off the clear liquid over clean, fresh eggs, which have been packed in a clean earthenware jar. At least two inches of liquid should cover the top layer of eggs.

Iodine stains may be removed from cotton or other white fabric by rinsing it in clear limewater, which has been heated to the boiling point. A few minutes' immersion is usually sufficient to remove the stain. Grease spots in table linens may be easily removed by soaking with limewater, which will saponify the grease, and then washing with clear water and soap. Whenever limewater is used, care should be taken to rinse the article thoroughly in clear water before drying.

Perhaps no single material is adapted to such general use as is lime, and while an attempt has been made to indicate some of its many uses, space is too limited to go into much detail on the subject.

Other Possible Medicinal Uses of Lime Hydrate or Carbonate

If certain lime manufacturers are to be believed, and we believe them, there are at least two or three well authenticated cases of tuberculosis cure, by the inhaling of lime and limestone dust about a lime plant. It is certainly logical, for lime is recognized in bacteriology as a destroyer of harmful bacteria—the acid-forming bacteria—in every form.

Maybe it is a far stretch of the imagination, but we can foresee the possibility of some sort of an aspirator for inhaling very fine lime dust in the hydrate or carbonate form, in one's own bed chamber, instead of putting in 10 hours a day working in a lime plant, as a cure for that dreaded disease, tuberculosis of the lungs — consumption. Anyhow, it is worth interesting the medical profession in—which so far as we know, never has been done.

Lime in Household Packages

The idea of putting up lime in small packages for household consumers is no new one. The Eastern Bureau of the

National Lime Association, under Henry M. Camp, director, has given this subject a lot of thought. A year ago, ROCK PRODUCTS published a story about a West Coast dealer who was actually doing this very thing on a small scale.

To be done profitably, however, the package business must be done on a *large* scale. One difficulty is to find a proper container. Lime deteriorates with age unless kept from contact with air and moisture. Therefore, the packages must be hermetically sealed, or air-proof. Quick-lime in tight packages would be positively dangerous if not also moisture-proof.

But neither of these things is *impossible*. An English biscuit manufacturer is selling a product in hermetically sealed tin boxes today. Fruit and vegetables are regularly sold in this manner, as everyone knows. The problem requires a little research and a little ingenuity, that's all.

Who'll Do It?

Is this a job for the National Lime Association, a lime manufacturer, or a promotional genius with previous experience in promoting and selling a staple commodity?

Talc miners and millers do not promote and sell talcum powder. The reason is that a concern engaged in producing and selling a commodity by the ton is not equipped physically or temperamentally, if we may use that comparison, to sell a commodity by the ounce and by the pound.

Likewise, the manufacturers of lime do not have the facilities or the business faculties, speaking generally now, to develop a nation-wide business in a small package commodity. For the same reason, it seems to us, an association of lime manufacturers can never give the intensive promotional activity and the concentration that must be given "to put this across."

But an individual with a genius for that kind of promotion, and with the spur of immense profits, if he can put it across, could make lime a household necessity. He would have to develop a trade-name and a trade-mark and he would have to spend hundreds of thousands of dollars advertising before he got any returns. But he could buy the raw material in any part of the country at from $10 to $20 per ton and at 20 cents to 30 cents per pound could realize a handsome profit.

It goes without saying such a genius should, and probably would, have the help of all lime manufacturers, individually and collectively. For if every family in the United States used ten pounds of lime a year, a conservative estimate at that, the result would be approximately 200,000,000 pounds or 100,000 tons added to our annual lime production—about a three per cent increase—but, the big thing would be the making of *lime* a household *word*, and the publicity value of this in the future promotion of *agricultural lime* alone would be worth thousands of dollars to lime manufacturers.

Lime and Physiology

APROPOS of the article elsewhere in this issue on household uses of lime, the following from the Chicago "Daily News" of April 12 is very interesting:

The average man has or should have about three pounds of calcium or lime in him, about one-fiftieth of the body weight.

Although laymen often assume that they are getting too much lime in drinking water or otherwise and that this may favor hardening of the arteries, there is no basis for such belief. On the contrary, there is good reason to think that, as Prof. H. C. Sherman of Columbia University says in his book ("Chemistry of Food and Nutrition"), "the ordinary mixed diet of North Americans and Europeans, at least among dwellers in cities and towns, is probably more often deficient in calcium than in any other chemical element."

Among foods of animal origin, fresh milk, buttermilk, skim milk and curdled milk (cottage cheese) are about the only ones which can be said to be rich in lime content. By the way, it is probable that actual benefit derived from a notorious highbrow patent medicine "nerve tonic" of whose efficacy ignoramus college professors and mossback doctors freely testify, and which is practically what Sam. Hop. Adams called "glorified cottage cheese," is attributable to the lime deprivation from which the testimonial writers suffer.

Vegetable foods furnish more lime than animal foods. The marked improvement in the nutrition of infants after the addition of small daily amounts of green or fresh vegetables such as spinach, carrots, orange juice, oatmeal, turnips, prune juice (all the solids well cooked and strained through a sieve until the child cuts teeth) may be due to the more adequate filling of the growing child's need for calcium for building bone, tooth and muscle.

Prof. Sherman has suggested the addition of powdered calcium carbonate (prepared chalk) to the salt in the salt cellar, equal quantities of each, as a means of supplying the calcium deficiency of the average dietary.

Our habit of denaturizing and otherwise maltreating foods which should furnish calcium along with other important factors—the food purveyors insist that this is a desirable "purification"—goes far to account for our annual $500,000,000 expenditure for medicines in America. Bread in this country is too often a counterfeit of the staff of life. We habitually discard in the milling the most essential and healthful portions of the wheat, in our insane desire to have a dead white flour. Calcium is one of the elements removed from the wheat in milling; iron is another; the vitamins of the wheat are another; the natural laxative and digestive stimulus, bran, is another. The result is fit food for a mollycoddle, and a great boon for the nostrum maker.

Someone sent me a sample of his particular brand of whole wheat—canned! By golly, that was the limit! One can purchase whole wheat from any farmer who raises wheat, cook it two or three hours, and enjoy a toothsome, wholesome, natural cereal and natural laxative combined. Yet this manufacturer cans the wheat and presents it canned and "prepared" and doctored with this and that addition. Does the public really demand that sort of thing?—William Brady, M. D.

Trade Associations Must Watch Steps

THE FOLLOWING from President Harding's message to Congress ought not to escape the attention of producers who are members of trade associations:

"I have said to the people we meant to have less of government in business as well as more business in government. It is well to have it understood that business has a right to pursue its normal, legitimate and righteous way unimpeded, and it ought have no call to meet government competition where all risk is borne by the public treasury.

"There is no challenge to honest and lawful business success. But government approval of fortunate, untrammeled business does not mean toleration of restraint of trade or of prices maintained by unnatural methods. It is well to have legitimate business understand that a just government, mindful of the interests of all the people, has a right to expect the cooperation of that legitimate business in stamping out the practices which add to unrest and inspire restrictive legislation. Anxious as we are to restore the onward flow of business, it is fair to combine assurance and warning in one utterance.

"One condition in the business world may well receive your inquiry. Deflation has been in progress, but has failed to reach the mark where it can be proclaimed to the great mass of consumers.

"Reduced cost of basic production has been recorded, but high cost of living has not yielded in like proportion. For example, the prices on grains and live stock have been deflated, but the price of bread and meats is not adequately reflected therein. It is to be expected that nonperishable staples will be slow in yielding to lowered prices, but the maintained retail costs in perishable foods cannot be justified.

"I have asked the federal trade commission for a report of its observations and it attributes, in the main, the failure to adjust consumers' cost to basic production costs to the exchange of information by 'open price associations,' which operate, evidently within the law, to the very great advantage of their members and equal disadvantage to the consuming public.

"Without the spirit of hostility or haste in accusation of profiteering, some suitable inquiry by Congress might speed the price adjustment to normal relationship, with helpfulness to both producer and consumer. A measuring rod of fair prices will satisfy the country and give us a business revival to end all depression and unemployment."

Georgia Granite Industry Grows

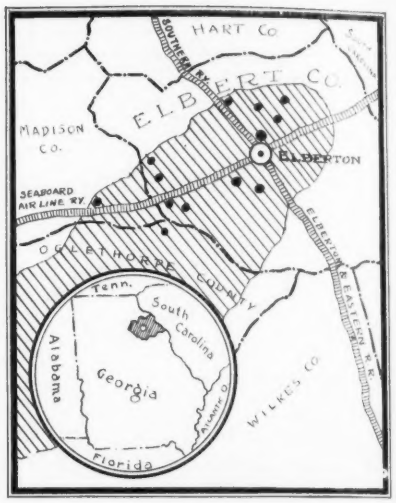
Elbert County Deposits of Increasing Commercial Importance

By S. Lee Vinson

ELBERTON, a thriving little city of 8000 inhabitants, located in northeast Georgia, has an industry that promises to make this little town of world-wide fame—that industry is granite. There are already in this city eight quarrying companies, turning out a large volume of monumental and structural granite annually, and five cutting sheds. There is room for many more to absorb the output of the quarries, and it is believed that within the next few years a considerable number will be established.

The supply of granite in and around Elberton is almost unlimited, for vast deposits underlie practically the entire county. Elbert County is the home of the famous "Blue Granite", which is already so well known, shipments of same being made to all sections of the United States, to Canada, and to many foreign countries.

A few remarks about the quality of this granite and the accessibility to shipping will be of considerable interest to readers of Rock Products, as all know or have heard something of this granite and the works at Elberton. Competing rail lines assure for Elberton's products permanent low freight rates. Three railroads—the Elberton and Eastern, the Seaboard Air-line, and the Southern furnish an easy outlet for the products. Close proximity to four or five of our Southern ports also brings her in touch with foreign markets. It is a fact that a carload or trainload of granite loaded at Elberton



Map of the Elberton Granite district of Georgia

Typical quarry view in the granite section of Elbert County, Georgia—Largely small individual operations

arrives on the same cars in Havana, Cuba. An unlimited amount of water power from nearby streams is also available.

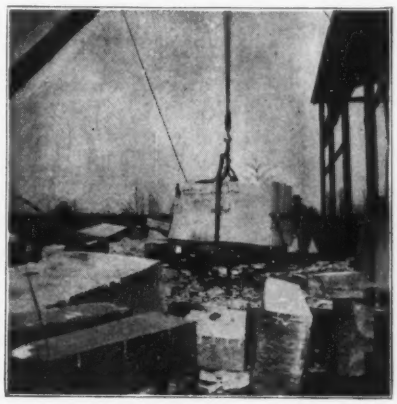
Within the radius of 10 miles of Elberton are a number of quarries which represent the northeast extension of a very superior belt of fine-grained, dark-blue, biotite granite. The stone is of an excellent quality, and is especially suited for monumental and interior decorative work.

The quarrying possibilities of Elbert County have scarcely been realized. From the surveys that have been made it is clearly evident that there is in this county an inexhaustible supply of very superior grades of architectural granites, admirably adapted and well suited to general building, monumental and decorative purposes.

For the past 35 years rock has been obtained throughout this section for local use, but only within recent years has quarrying been done on a regular and systematic basis, and this has scarcely begun. However, the output at present is so great that the opportunities are good for finishing plants to be established in Elberton to take care of the raw output of the quarries. A plan is on foot at the present time which will make this plan a feasible one, and which it is believed will attract a great many "finishers" to Elberton. The Granite Sheds Co., an organization to encourage and promote the development of the granite industry in Elbert County, is working to make Elberton the wholesale granite center of the South.

Quoting from a report of the State

Channeling with small air drills



Handling blocks to shed

Building and monumental stone working

Interior view of a typical Georgia granite-working mill

Geological Department, which made a thorough study and exhaustive tests of the granite resources of Elbert County: "The Elberton granite area, by virtue of the excellent qualities of the stone and its ready accessibility by railroad, bids fair to become one of the principal localities for high-grade monumental stone in this country. Its granite has already grown prominently in favor for this use, and each year the demand for this stock is increased. It possesses good working qualities under the hammer, and takes a high uniform, even polish, with striking contrast between the cut and polished surfaces. Its uniformity in color and texture, fineness of grain, freedom from imperfections and blemishes, and great strength and durability to resist atmospheric agencies give it first rank as a monumental stone."

The results of an examination of the rock in its natural outcrops, where it has been exposed for perhaps thousands of years, add further testimony to its durability and permanence. Notwithstanding the great period of time during which this rock has been exposed, the examination showed that the decay was remarkably small.

The Elbert County granites are massive rocks, varying from a light gray to a dark blue-gray in color, and from medium to fine even-grained. Geological analysis has found that they carry biotite as their chief accessory mineral.

A very important test made was that to determine the percentage or ratio of absorption, which determines the stone's ability or power to resist freezing temperatures. The tests show the percentage (ratio) of absorption to vary from 0.090 to 0.096.

From the above figures it will be seen that these granites show an absorption of less than one-tenth of one per cent, the ratio of absorption being reduced to a mere nothing as compared with that of many other granites. Granites are capable of absorbing some two-tenths of one per cent of additional moisture. On account of the rock being so compact and close-grained, it will not be appreciably affected by cold. The Elbert County stone is a high-grade superior stone,

This article would certainly not be complete without some mention being made of the mild climate of the section where Elberton is located, which makes it possible to do finishing work under open sheds during the entire year. This fact cannot be too strongly emphasized, and is one that finishers take as being a distinct addition. Where the climate is too cold for this work to be done in open sheds, the cost of construction of the sheds is more than where this is not necessary, while at the same time the living conditions, due to the large amount of dust necessarily raised, are not nearly so good.

Urges Lime as Dairy Ration

Is Necessary for Results of Best Character; Also as Health Preservative

W. H. LYTLE, Oregon state veterinarian, discussing the question, "Why Lime in a Dairy Ration?" explains that he features the word "lime" in this connection in preference to the words "mineral matter" owing to the fact that, of the nine mineral elements required in life processes, calcium or lime is the one most frequently lacking.

The need of the dairy cow for lime in comparatively large amounts is logical, the writer shows, owing to the fact that she is an unparalleled producer of mineral nutriment for the human family. In 100 pounds of milk she gives seven to nine-tenths pound of mineral. In order to produce this amount the drain on her system must be so supplied that one-twentieth of her weight will be constantly maintained as mineral matter. Obviously, her mineral food requirements are, therefore, in proportionate ratio to her eliminative demands. If she does not receive the required mineral, the cow does not produce the normal mineral percentage in her milk—just as certain soils will not give up their plant food nutrients unless lime has been applied to them in adequate amounts.

Lime Counteracts Acidity

Again, mineral amendment is necessary in the dairy ration to counteract acidity in the feed. Dr. Lytle says:

"The use of silage tends to cause a marked loss of mineral in cattle. This is particularly true when these animals are fed and so closely housed throughout the year as to prevent access to outside pasture. The acid content of the silage requires a considerable lime content or alkaline content to neutralize it and prevent the digestive system and the whole animal body from suffering from too much acid.

"The mineral reserves of animals can best be built up and maintained by growing them largely on leguminous roughage or on forage and pasture containing an abundance of legumes, which contain a high mineral content of all of these elements. Sunshine and muscular activity increase the affinity of bones and tissues for these mineral salts. If animals cannot be fed a sufficient amount of leguminous roughage, particularly cattle, during advanced pregnancy and during heavy lactation and if there are reasons to believe that a sufficient amount of mineral food is lacking, then bone flour or crude calcium phosphate should be supplied."

Mineral Combats Disease

The presence of lime, Dr. Lytle finds, is instrumental in combating disease.

In the case of tuberculosis, it would seem that mineral amendment in the diet might assist substantially to solve some of the problems of the arrest and control of this malady. "The spread of tuberculosis is confined largely to animals that are undergoing demineralization such as milk cows being heavily drained of many of the mineral salts through the solids secreted in their milk and in beef cattle being fed a highly carbohydrate ration deficient in mineral elements." It is significant that the calf fed on milk in which is to be had all of these essential mineral salts resists tuberculosis generally until after his milk ration ceases or until it is largely supplemented with other forms of food.

In one case, a herd of 40 cows, fed and ranged on level, gravelly ground for a number of years, developed a stubborn form of abortion. All manner of treatment was tried but the difficulty seemed not to be of bacterial origin. Finally, the owner secured a new ranch, placed the animals on a well-balanced ration supplemented with roughage, and almost immediately the animals took a turn for the better and the abortion trouble ceased.

"It is a common occurrence," the writer says in connection with a discussion of breeding problems, "to find instances where a whole herd will fail to breed over a limited time without evidence of abortion being present . . . . I have made some little investigation of this situation and have always found that the good calf country of Oregon is always a heavily alkalied district. Invariably the cattle man will tell you, if you want to get into the breeding stock game, you must get to a range with lots of alkali upon it." It has also been found that animals which have been fed essential minerals before calving seem to resist milk fever to a considerable extent. "Indeed, it is possible to cure milk fever by the proper use of a solution of essential minerals without resorting to udder inflation."

"The so-called weak calf trouble that frequently is seen during the spring months is doubtless nothing more than nature's protest against mineral deficient ration."

This article and many others that are coming to light suggest the importance of much more attention to the lime content of the animal as well as the plant ration and the consideration of means of getting this much needed mineral element to the animal in suitable form.

Slate Dust in Asphalt Road Surface Mixtures

Experiments by the United States Bureau of Mines Show Most Encouraging Results

By Oliver Bowles
Mineral Technologist, Bureau of Mines

IT IS NOTEWORTHY that 80 to 95 per cent of the gross production of all slate quarries in the United States is discarded as waste. In view of the loss involved in handling so much waste, and the consequent added cost of the finished product, the Bureau of Mines has undertaken a study of the slate industry for the purpose of devising the best means of reducing the proportion of waste, and of utilizing the unavoidable waste. The utilization of waste has received special attention, and the co-operation of many prospective purchasers of waste slate has been enlisted in testing its adaptability for various uses.

Road Asphalt Mixtures*

The manufacture of filler for road asphalt mixtures is a promising field for slate waste utilization. In the preparation of asphaltic mixtures for surfacing roads, in addition to the sand, or stone and sand aggregates, finely pulverized limestone or portland cement are used as fillers. In asphaltic mixtures in which by-products asphalt is used the weight of filler and asphalt are substantially the same, but when Trinidad and certain other native asphalts are used a somewhat smaller proportion of filler is required. The tonnage of filler used in such asphalt mixtures is very great, one authority estimating that the city of New York alone requires 50,000 tons per year. As road building is such an important industry, and as intimations had been received from several sources that slate flour constituted a superior filler for road asphalt mixtures, an attempt was made to obtain more definite data as to the adaptability of slate flour for such a use.

In order to obtain practical tests the co-operation of manufacturers was requested, and as a result several companies kindly offered to test the material in their experimental laboratories. Samples of finely pulverized slate were submitted for this purpose. Results of the most complete tests are given in the following paragraphs:

Impact and Compression Tests

The slate flour submitted was of such a fineness that 99.3 per cent would pass a 100-mesh, and about 80 per cent pass a 200-mesh screen. Tests were made to determine its suitability as a filler in asphalt pavements, both on asphalt bonded briquets and on standard sheet asphalt pavement mixtures.

The standard sheet surface mixture was tested for impact with a large Page impact machine having a 2-kilogram hammer dropping from a height which was increased 1 centimeter with each successive blow. For the asphalt bonded briquets a small Page impact machine was used. The cementing value under compression was determined by subjecting the briquets to pressure increasing uniformly at the rate of 600 pounds per square inch per minute.

Similar mixtures with limestone dust and portland cement, the materials commonly employed as fillers in asphalt pavement, were prepared, using the same proportions by weight as in the slate flour mixtures given above. The results of the tests are shown in the following table:

Results of Tests

ASPHALT BONDED BRIQUETS

Material	Impact	Comp'n lbs. per sq. in.	Remarks
Slate flour	59	897	Briquets flattened; good cementing value
Portland cement	59	764	do
Limestone dust	58	600	do

STANDARD SHEET SURFACE MIXTURE

Material	Impact	Compression
Slate flour as filler, 13%	25	572
Portland cement as filler, 13%	20	493
Limestone dust as filler, 13%	24	600

From these results it is evident that in asphalt bonded briquets slate flour is superior to both portland cement and limestone dust in resistance to compression, which is a measure of its cementing value. In the standard sheet surface mixture it is intermediate between limestone dust and portland cement. As regards impact, there seems to be little choice between the three substances tested as filler in asphalt bonded briquets, but in standard sheet surface mixture there is some indication of superiority on the part of the slate flour.

It is to be noted that the proportion of fillers used was determined on the basis of weight and not of volume, and as the materials used vary in specific gravity a different volume was used in each instance. If the fillers had been added on the basis of volume somewhat different results might have been obtained, particularly for portland cement, which is considerably heavier than either limestone or slate. The results obtained therefore are indicative only, and are not conclusive.

Settlement and Decantation Tests

In any dust used in asphalt mixtures, only that part which is finer than 200 mesh is available as filler, all material coarser than 200 mesh being regarded as aggregate rather than filler. Clifford Richardson in his book entitled, "The Modern Asphalt Pavement", states that "only particles smaller than 0.05 mm. in average diameter are to be regarded as true dust, and it is even better to have a considerable proportion of the dust finer than 0.05 mm. in diameter." The best way to determine the percentage of very fine material is by settlement and decantation tests.

Such tests of slate-dust samples were made in the laboratory of the Bureau of Mines in accordance with the method outlined by Richardson and termed by him the elutriation method. Five grams of slate dust were placed in a 600-c.c. beaker about 120 mm. high. The beaker was then nearly filled with distilled water at a temperature of exactly 20 deg. C., and the contents were agitated with an air blast until the dust and water were thoroughly mixed, care being taken to produce no cyclonic currents. The liquid was then allowed to stand for a fixed period of time, after which the water and suspended dust were decanted, leaving the sediment in the bottom of the glass. This was repeated three times. It is regarded that particles thus held in suspension for a 15-second period have a diameter of approximately 0.08 mm., and those that remain in suspension for a period of 1 minute have a diameter of 0.05 mm., although these figures may vary somewhat, depending on the specific gravity of the materials employed.

These tests were made with materials various percentages of which failed to pass a 200-mesh screen. As 200-mesh material only is to be considered as effective filler, it seemed important to eliminate from the determination the percentage of material coarser than 200-mesh, and to recalculate the fine dust on the basis of that which passed 200 mesh. For purposes of comparison a recalculation was made, indicating the percentage of 300-mesh slate flour which remains in suspension at the end of one minute. It was observed that the material held in sus-

*Acknowledgment is hereby made of information on asphalt mixtures kindly supplied by H. M. Milburn of the Bureau of Public Roads, Department of Agriculture.

pension at the end of a 15-second period is a little finer, though almost equivalent to that which passes a 200-mesh screen. Material held in suspension at the end of one minute is considerably finer than that which passes a 300-mesh screen.

In order to arrive at an intelligent comparison of slate flour with other filler materials the following table has been prepared from Richardson's results as given on page 94 of the book to which reference has already been made. The percentages have been recalculated on a 200-mesh basis:

ELUTRIATION TESTS AS GIVEN BY RICHARDSON
(Time of Subsidation, 15 Seconds)

Material	Screen Test Through 200 Mesh Per Cent	Percentage Decanted	Percentage Recalculated on a 200-Mesh Basis
Limestone	84.0	71.3	84.9
Trap rock	81.0	70.3	86.8
Portland cement	74.0	56.7	76.6

From this table it may be seen that for limestone, trap rock or portland cement only 75 to 85 per cent of the 200-mesh material is to be regarded as fine dust suitable as a filler, while the fine dust in slate flour approximates 100 per cent of all that passes the 200-mesh screen. Slate dust is, according to these tests, a much more economical filler than either limestone or portland cement, in that it provides a larger amount of effective filler for each ton of pulverized material purchased. It is to be observed that in modern practice portland cement is somewhat finer than that used in the above tests, and consequently may give better results.

Volume Weight

Filler materials are purchased by weight and, other considerations being equal, that filler is the most economical which occupies the greatest space per weight purchased. A very heavy filler fills a relatively small space as compared with a light one. As specific gravity is the weight of a unit volume of a material compared with that of an equal volume of water, specific gravity may be regarded as a measure of relative volume weight. A comparison of the fillers under consideration indicates that portland cement has a specific gravity of about 3.1, average limestone about 2.77, and the average slate of Northampton County, Pa., about 2.78. Slate is, therefore, about equal to limestone in this respect, and has an advantage over portland cement by about 10 per cent in volume for a given weight.

Cost

It is difficult to make any definite statement as to relative costs of fillers, for the production of pulverized slate is an industry not yet established on a sufficiently large scale to permit uniform price quotations in bulk shipments. For the limited shipments now made in barrels and bags in carload lots, prices vary greatly in different localities. It is safe to estimate, however, that slate flour can be placed on the market at little more than half the present price of portland cement. Current prices of pulverized limestone indicate a decline almost to pre-war levels, and it is yet an open question whether producers of slate flour can compete successfully in price with producers of pulverized limestone.

Summary

In order to find a useful outlet for waste material at slate quarries, tests were made to determine its value as a filler in asphalt road surface mixtures. Actual tests in laboratories of companies preparing road asphalt mixtures indicate that for resistance to impact slate flour is about equal to other fillers in bonded briquets, and somewhat superior in sheet surface mixtures. In cementing value it is superior to both limestone and portland cement in asphalt bonded briquets, and intermediate between them in standard sheet surface mixture. Elutriation tests indicate that slate flour contains approximately 15 to 25 per cent more of the fine dust that constitutes effective filler than either limestone, trap rock or portland cement. In volume weight slate is about equivalent to limestone, and approximately 10 per cent superior to portland cement. The cost of slate flour is little more than half that of portland cement, but its ability to compete in price with limestone is not yet established.

Conclusions

The tests already made are not sufficiently comprehensive to give conclusive results, but they are definite enough to suggest possibilities of such importance as to induce further and more extended research, both by slate producers and by manufacturers of asphalt road mixtures. The preliminary tests recorded above indicate that the use of slate flour as a filler in asphalt road surface mixtures would result in improved highways, and that a wide use of such filler would afford a profitable outlet for waste slate with consequent advantage to the slate producing industries. It is highly desirable that the conclusions reached in laboratory tests be verified by practical tests on experimental roads.—U. S. Bureau of Mines, Reports of Investigations.

Asphalt Association Asks for Lower Freight Rates on Mineral Aggregates

THE SECOND ANNUAL CONVENTION of The Asphalt Association, held at the association headquarters in New York, April 13, marked important general advances in the roadbuilding and street paving field. The association, which is the national organization of asphalt producers, asphalt machinery manufacturers and asphalt paving contractors, took the lead in advocating measures which, if adopted, will go far toward placing the road building and street paving industry on a higher plane and a sounder footing and will not only create more wholesome competition but eliminate waste and extravagance in highway construction.

President Draney predicted that, unless reactionary pessimism grips the nation, 700,000 men will be needed in the building of the 35,000 miles of new highways contemplated this year under the billion dollar road program outlined by the federal government and the states and counties. Three hundred thousand more men, he said, will be needed in the quarries, gravel-pits, cement, brick and asphalt plants and factories devoted to the manufacture of road machinery. The road-building boom, he thought, will work great benefit to the railroads by bringing into service one hundred thousand idle freight cars to transport one hundred million tons of road materials.

Taking the stand that efficient engineering and executive management are essential to the improvement of the nation's highways; that highway expenditure should be proportioned to traffic importance; that advantage should be taken of every opportunity to benefit by the road-building experience of other nations; that the unemployed of the nation should receive employment as quickly and extensively as possible, and that a vigorous public works program will offset industrial depression, the association adopted resolutions as follows:

1. Urging Congress to pass the federal aid appropriation of $100,000,000, thus assuring a continuance of road-building under the supervision of skilled state and federal engineers.

2. Urging that highway management be divorced from politics and all materials and methods entering into highway construction be placed in open competition.

3. Declaring that every highway be required to show traffic justification for its construction, thus guarding against waste and extravagance.

4. Memorializing Congress to authorize the United States to join the Permanent International Association of Road Congresses made up of the highway departments of all nations.

5. Urging the Interstate Commerce Commission to authorize a reduction in freight rates for road materials, thus stimulating the road-building program.

6. Recommending that public officials carry forward road-building programs to the extent permitted by appropriations available, thus giving employment to many hundred thousand men now out of work and utilizing tens of thousands of idle open top freight cars.

The directors elected F. P. Allen of the Standard Oil Co. of Indiana, Chicago, Ill., as vice-president to succeed J. M. Woodruff of the Sinclair Refining Co., Chicago, and re-elected J. E. Pennybacker, secretary.

Use of Silica and Other Mineral Fillers in Paints

VI—Selection of Proper Mineral Inert—Producer of Rock Dust Only Starts Milling Process—Summary

By F. P. Ingalls
Chemist, John W. Masury & Son, Manufacturers of Paints and Varnishes, Brooklyn, N. Y.

THE INTELLIGENT SELECTION of inert best suited to requirements is also influenced by its friability, or readiness with which it may be reduced to fine powder by grinding. Everybody recognizes that fine grinding is necessary for good paints, but what does "fine" mean? We have already seen that some paints may have a spreading rate as high as 1,400 sq. ft. per gal., but perhaps a rate of 600 to 900 is nearer the regular practice. At 800 ft. the cost is 1/500th of an inch thick and particles of pigment having a diameter greater than this would protrude. Any consideration of the behavior of flat or scaly particles is too complicated to be introduced here, but it is essentially accurate to state that, in general, to make good paint the pigment particles should not exceed 1/500th of an inch in size. In discussing sizes of this magnitude the "micron" is by far the most convenient unit. A micron is a length equal to 0.001 millimeter or 0.00003937 inch, and we shall use this unit in our further discussion; 1/500th inch therefore is equivalent to 50.8 microns.)

Paint Manufacturer Must Always Continue Grinding Process

In any process of mechanical grinding, however conducted, the particles are not all reduced to the same size; even with flotation systems, whether of air or water, this is also true although the grading is of course much sharper. Under these circumstances we can speak of *average* size only, meaning thereby the average of the diameters of all the particles in any representative sample of pigment.

In practice, uniformity of size is never reached and it is doubtful if any advantage would accrue even if it were reached; on the contrary, such evidence as we have indicates that for oil vehicles and the general run of pigments it is better to have a rather wide range in particle size, with the maximum somewhere around 50 microns, the minimum perhaps about 0.5 micron and an average of somewhere between 5 and 30 microns; in varnish paints and enamels it is probably better to have the particle size more uniform with an average of 1 to 10 microns inclining to the smaller rather than the larger limit.

At the present time assumed knowledge on this ground is largely speculative, for it is no easy matter to measure the average size of pigment in a well-ground paint. Recently, Dr. Henry Green, in the research laboratory of the New Jersey Zinc Co., has measured fully dispersed zinc oxide (i.e., separate particles not flocculated together) and found the average to be 0.46 micron with a very short range between the maximum and minimum. This explains in great measure why zinc oxide, carbon black, paranitranilin red, and a few such pigments, make such perfect enamels, for all these are fine almost to the limits of ordinary microscopic measurement and fairly uniform in particle size.

Producer of Rock Dust Only Starts Milling Process

It becomes clear then that although inerts may come into the market as "200-mesh," "300-mesh, "floated," "impalpable," etc., they are in fact merely started on their way to fine paints, and, the paint manufacture must carry the subdivision much further; but since some of them resist this further reduction much more than others, the selection for any given high-class paint becomes a matter of considerable importance, both as regards smoothness of product and cost of production.

Another thing to be considered in making selection is the presence, accidental or habitual, of varying quantities of adventitious substances, small enough in amount to escape ordinary inspection but so highly reactive with the usual vehicles as to render the whole lot or brand useless. For instance china clay, as well as whiting, may show an alkalinity corresponding to 0.05 to 0.10 per cent of free CaO, an alkalinity which is sure to be followed by troubles essentially vital. Some of the hydrated silicas and silicates take up hygroscopic moisture and retain it so tenaciously that it leads to troubles, frequently difficult to trace. Many such faults may be corrected easily but they must not be overlooked.

General Summary

However important these finer details may be to the manufacturer of competitive paints, and to the sellers of the several inerts, they do not invalidate the fundamental accuracy of our statements as made, and so with these concessions to rigid accuracy we may summarize our subject-matter as follows:

Quartzose, or hard, silicas are best adapted to paste wood-fillers and filler stains in paste form;

Soft silicas find good application in ready-mixed fillers and filler stains. They may also be used as a general inert extender wherever such extenders are desirable or economical.

Inerts in general are used to reduce cost, rarely to enhance the durability of the paint. They are more especially useful in conjunction with relatively expensive colors having a superfluous hiding power.

They may form a large part of the pigment in many kinds of undercoatngs and undergrounds over which more expensive finishing coats are to be applied.

When used to reduce strong colors the limit of reduction is reached when the hiding power of the first coat is visibly impaired. If however the color pigment be one of those which have a pronounced influence in prolonging the life of the vehicle, then the limit of economical reduction may be reached much sooner and should not be carried far enough to impair noticeably such favorable influence.

In Outside Whites and light tints there is little field for inerts on first-class work. The darker the color the better it will stand reduction, but, except in the strong colors, it is doubtful if any tolerable proportion of inert offers sufficient economical advantage to the consumer to justify its use. For unplaned lumber, or other rough absorptive surface, the economical proportion of inert is variable according to the conditions of use. There are certain special combinations of inert with white pigments, especially zinc oxide, which give economical service on first-class work even though the proportion of corrective inert be relatively large.

In Oil Colors used for tinting, inerts should not be present except in one or two instances where the colors are frequently thinned and used for direct painting in self color. In such cases the presence of the inert should be acknowledged and the market value based on the volume of actual color present and not on the percentage by weight.

Paints containing Lakes either as the whole or a part of the pigment may be

expected to contain inerts, no matter what the type of paint.

The different types of paints are classified almost wholly in accordance with the kind and character of the vehicle, practically not at all by the pigment. House Paints are thinned with oil, Flat Paints with volatile thinners, Enamels with varnish, and so on. In like manner any type of paint is good or bad more in accordance with whether the vehicle is good or bad. These matters are largely independent of the pigment whether inerts be present or not.

There is nothing inherent in the inerts which causes them to be bad actors; on the contrary, they are more stable and safer than the general run of pigments, but they sometimes contain traces of accompanying substances which are so highly reactive with paint vehicles that troubles ensue. Inasmuch as they are cost reducers they must be cheap as well as good, and to be good they should be free from color, have a refractive index of less than 1.60, and be finely ground. With regard to fineness, *average* particle size with exclusion of coarse particles is what counts. Just how "fine" the average size should be, and whether the range between maximum and minimum should be wide or narrow, depends upon the kind of paint, but in general the paint grinder must reduce the size to less than 30 microns and any particle much over that size will stick up through any but a very thick coat.

The real merit of a paint is measured by its ultimate economy to the consumer. Whether it is adulterated or not depends upon whether or not the consumer has been misled in regard to its composition. The presence or absence of inerts is a question of economy, but the choice should rest with the consumer and be voluntary.

Selection of Limestone for Making "Agstone"

Qualities and Requirements of Material Suitable for Application to the Soil

THE COMPOSITION which a limestone should have for making good ground limestone for agricultural purposes, depends somewhat on conditions, but in general it may be stated that more than ten per cent of impurity is objectionable, except in special cases. The greater the proportion of impurity, the greater is the amount of stone required in order to produce a given amount of calcium and magnesium carbonate. Thus, a ton of pure limestone will produce one ton of carbonate, but to produce a like amount from a stone only 80 per cent pure, would require the pulverizing of one and one-fourth tons of the material.

The greater cost of quarrying, grinding, hauling and applying the impure stone is at once apparent. In those regions where only the relatively impure limestones are available, however, their use even at the increased cost of handling may be more economical than the use of the higher grade material which must be shipped in at a considerable cost in freight. This is a matter which must be determined locally. High grade stone contains 95 per cent or more of calcium carbonate, or its equivalent in combined calcium and magnesium carbonates; medium grade contains 85 to 95 per cent; low grade 75 to 85 per cent and inferior grade under 75 per cent.

While most limestones contain the carbonate largely in the form of calcium carbonate, which is usually considered the most desirable form for agricultural purposes, many of them contain greater or less quantities of magnesium carbonate also. So far as soil sweetening is concerned, the magnesium carbonate is not objectionable* and limestones may contain almost one-half the carbonate in the form of magnesium carbonate, as in the case of the true dolomites, and still be ground for agricultural purposes. The application of very large quantities (five tons or more) of magnesium carbonate is not considered desirable on most soils, however, so that the high calcium stones are generally preferred, except on soils which are naturally low in magnesium.

As far as its physical properties are concerned, any kind of limestone is suitable for agricultural lime. Fine-grained, dense stone is as valuable as the coarsely crystalline stone, provided the purity is the same. Evidently one of the first points to be considered in the manufacture of ground limestone is the selection and opening of a suitable deposit. It should be ascertained that the quality is reasonably uniform throughout the deposit and that a sufficient quantity of stone is above drainage level, so that the quarry floor will not be continually under water. Transportation facilities and other details of similar importance should be carefully considered.—Bulletin of the Missouri State Geological Survey.

*Chemically considered, magnesium carbonate is slightly more effective than calcium carbonate as a neutralizing agent, one part of magnesium carbonate being equivalent to one and nineteen hundredths parts of calcium carbonate. One hundred pounds of stone containing sixty-five per cent calcium carbonate and thirty per cent magnesium carbonate with five per cent impurity would actually have a neutralizing power equal to one hundred pounds of pure calcium carbonate.

Agricultural Marl Company Granted Trade Mark

THE CLAREMONT MARL PRODUCTS CO., of Claremont, Va., has been granted a trade-mark, "Marlime (Nature's Own)", for its product. The trade-mark is for agricultural marl marketed by the company as soil fertilizer. The application for the trade-mark was filed May 1, 1920, and registered April 26, 1921.

Proposed Texas Cement Plant

CASTROVILLE, Texas.—W. S. Campbell, of San Antonio; L. C. Ihnken and John J. Shorp, of Castroville, have formed the Gulf Portland Cement Association and filed a declaration of trust for a capitalization of $300,000. It is planned by the association to build a large plant here for the manufacture of cement, according to Mr. Campbell, who is a construction engineer and has been identified with the cement industry for many years. The deposit which the association is to develop near here is said to be one of the largest in the United States. In outlining the plans of the association, Mr. Campbell said:

"The Gulf Portland Cement Association has acquired one of the largest deposits of raw material in the country. The supply seems to be almost unlimited and our engineering reports show it to be far in excess of the 25 years usually stipulated in investments of this character. This material is unusually favorable as to its softness, location, gravity installation features for the plants and transportation. These deposits are about a mile and one-half to two miles out of Castroville and within three and one-half miles of the Southern Pacific Railroad. The plant will put in its own spur.

"I estimate from a survey I have just completed of these properties that we can produce a fine grade of Portland cement at our plant at Castroville for a little in excess of 50 per cent of what it now costs the average Portland cement plant to produce it. There are several reasons why we can do this.

"One is that we have this deposit in a hill with a level spot ideally situated at the base for our plant. This will enable us to utilize gravity throughout the entire operation. We also have a soft formation and it is not overlaid with earth to any extent but comes right to the surface. We can handle our entire output of raw materials with steam shovels. Where a plant in the hard limestone country would require about 150 men with large sums for powder, drilling, etc., we can operate our shovels with about 15 men."

Practical Chemistry for Lime and Cement Manufacturers

Ores—Smelting—Chemical Compounds of the Metals

By Richard K. Meade, M. S.
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THE MINERALS from which the metals are obtained are called *ores*. Some metals occur in nature free or uncombined with other elements. Among those most frequently so found are gold, silver, copper, platinum and mercury. Metals most often occur combined with the non-metals as oxides, sulphides, carbonates, sulphates, silicates, etc. The more important ores of the metals are given in the list below:

ORES FROM WHICH THE METALS ARE CHIEFLY DERIVED

ALUMINUM, *Bauxite* (oxide).
ANTIMONY, *Stibnite* and *Orpiment* (both sulphides).
BISMUTH, *Bismutite* (carbonate).
CHROMIUM, *Chromite* (double oxide of chromium and iron).
COPPER, *Chalcopyrite* (double oxide of copper and iron). *Marachite, Azurite* (both basic carbonates). *Cuprite* (oxide). *Calcocite* (sulphide).
GOLD, found native.
IRON, *Magnetite* and *Hematite* (both oxides).
LEAD, *Galena* (sulphide). *Cerussite* (carbonate).
MANGANESE, *Pyrolusite* (oxide).
MERCURY, *Cinnabar* (sulphide).
NICKEL, *Niccolite* and *Gersdorfite* (arsenical compounds of nickel).
PLATINUM, found native.
SILVER, found native, also *Argentite* (sulphide) and *Cerargyrite* (chloride).
TIN, *Cassiterite* (oxide).
ZINC, *Sphalerite* (sulphide). *Zincite* (oxide).

That branch of chemistry which treats of the extraction of the metals from their ores is called *metallurgy*.

Smelting

When the metal occurs free in nature its extraction from the ore is simple. Most people know how the miner extracts free gold from the ore by washing it with water, or "panning" as he calls it. In other methods the gold is leached or dissolved out of the ore by means of some solvent for it, such as a solution of sodium, or potassium, cyanide.

When the ore is an oxide, it is usually reduced by heating it with carbon as the carbon extracts the oxygen and leaves the metal free. Thus: $2Fe_2O_3+3C=3CO_2+4Fe$. In the case of some metals, notably manganese and chromium, aluminum powder is used in place of carbon to combine with the oxygen. A carbonate or a sulphate ore is roasted; in the case of the former the carbon dioxide is driven off and the oxide remains just as when lime is burned, while with the latter, the sulphur is removed and the ore converted at the same time to an oxide by the oxygen of the air. In both cases, the resulting oxide is then treated as an oxide would be by heating with carbon.

In smelting, a flux is usually added which combines with the foreign matter in the ore and the ash of the fuel to form a fusible *slag*. This slag is in a melted state and does not mix with the ore but on the contrary, owing to the fact that it is lighter than the molten metal, remains on top of the latter and may be skimmed or run off the metal below, just as cream is drawn or ladled off of milk. This is the function of limestone in furnace work, i.e., to form this slag, since lime unites with silica and other impurities in iron ore to form a fusible complex silicate.

Chemical Compounds of the Metals

The starting point in the chemistry of the compounds of the metals is the oxides. The metals all form oxides. These oxides may be prepared by burning the metal in air or by heating the carbonate, the nitrate or the hydroxide. All the oxides are practically insoluble in water, but the oxides of the metals of the potassium and calcium groups when brought in contact with water, inter-react and form the hydroxides.

The hydroxides may be made in a few instances by treating the oxides with water as above, but are more often made by double decomposition between a soluble salt of the metal and a soluble hydroxide. Thus when calcium hydroxide is heated with a solution of sodium carbonate, an interchange takes place and calcium carbonate and sodium hydroxide are formed. Thus:

$Ca(OH_2)+Na_2CO_3=CaCO_3+2NaOH$

In other words: Calcium hydrate + sodium carbonate = calcium carbonate + sodium hydrate.

In general it may be said that each metal will form with each acid a salt. Only a few of the salts of each metal are of commercial importance, however. The chief salts are the chlorides, sulphates, nitrates, sulphates, carbonates, sulphides, silicates and phosphates. In many cases, the salts can be made by dissolving either the metal, its oxide or hydroxide directly in the acid. Chlorides, sulphates and nitrates are often so made. For example:

$Zn + 2HCl = ZnCl_2 + H_2$

In other words: Zinc + hydrochloric acid = zinc chloride + hydrogen.

In other cases, notably in that of sulphides, phosphates and carbonates, the sale is often prepared by double decomposition. Thus:

$CaCl_2 + Na_2CO_3 = 2NaCl + CaCO_3$

In other words: Calcium chloride + sodium carbonate = sodium chloride + calcium carbonate.

Sometimes chlorides can be formed by direct union of chlorine with the metal and sulphides by direct union of sulphur and the metal. Silicates are usually prepared by fusion of the oxide of the metal with silicon dioxide (silica). Examples of such reactions are following: Finely powdered iron heated with sulphur will give iron sulphide, the reaction being represented by the equation,

$$Fe+S=FeS$$

A mixture of sodium oxide and silica (silicon dioxide) when fused give sodium silicate, thus:

$$SiO_2+Na_2O=Na_2SiO_3$$

(To be continued)

Sand and Gravel Concern with Concrete Products Business

FORT WORTH, TEXAS—The Union Sand and Mfg. Co. here will begin the construction of a plant at once for the manufacture of reinforced-concrete structural units soon. The company also plans to open sand and gravel pits near Riverside. These pits will be able to turn out 40 tons of sand and washed gravel a day. The company has a capital stock of $100,000 and the patents for the reinforced concrete structural units were taken out by L. L. Burton, president. The units are of wall length, making it possible for them to be installed by common laborers. They can be used in the construction of residences and business buildings alike.

"The use of the units will cut down concrete construction more than 30 per cent," Mr. Burton said. "I expect that their use will tend to revolutionize building construction. They have been approved by some of the leading architects of the country."

Mr. Burton returned recently from Chicago, and said that equipment for the plant already had been shipped from Chicago, St. Louis and Birmingham.

Plastic Gypsum Plaster*

Fine Grinding Under Conditions to Prevent Escape of Moisture May Revolutionize Gypsum Plaster Industry

By Warren E. Emley
United States Bureau of Standards,
Washington, D. C.

A GOOD job of wall plaster is composed of three coats, which are known to the trade as "scratch," "brown" and "finish." The scratch coat is next to the lath, the brown coat in the middle, and the finish coat is applied to the exposed surface to give the plaster a pleasing appearance.

The quality requirements put upon material for the finish coat are peculiar: It must be very plastic in order that it can be spread in a thin layer (1/16 in.) over the brown coat, which has set and is partially dry; and it must set in 20 or 30 minutes, in order that the plasterer may finish troweling it without moving his scaffold.

The scratch and brown coats may be made with either plaster of paris ($CaSO_4 \frac{1}{2} H_2O$) and sand or of lime and sand, but the finish coat must consist of both lime and gypsum plaster. The addition of lime has been thought necessary to give the proper degree of plasticity. As the weight of the finish coat is very small in comparison with the weights of the two other coats, the contractor must provide enough for all three coats and a small amount of lime for the finish coat mixture when gypsum plaster is used. It seems impossible to get good results with a ready mixed lime gypsum plaster. The lime must be soaked with water for at least 24 hours in order to develop its plasticity, and the gypsum cannot be soaked, because it sets upon the absorption of 1½ mols of water of crystallization. This means that the materials must be prepared separately and mixed just before being used, thereby requiring extra labor and equipment.

The higher plasticity of lime gives superior sand carrying capacity. If lime and gypsum plaster are selling at about the same price, the fact that lime can carry three parts of sand for scratch or brown coat work, while the latter can carry only two, makes the lime plaster much cheaper. At the same time, the superior plasticity of the lime may reduce the labor cost of application of the plaster considerably below that of the gypsum plaster.

From the above statements it will appear that if a plastic form of gypsum plaster can be made without the use of hydrated lime, the differential in favor of lime, due to its greater sand-carrying capacity, will be overcome. Also it will not be necessary for the gypsum manufacturer to add lime or any other foreign material (except retarder) in the preparation of neat gypsum plaster. These results are greatly to be desired, not only by the gypsum industry, but also by the general public, because they would tend to decrease the cost of an important building material.

Accordingly, work was started on an attempt to make gypsum plaster as plastic as lime. The first successful experiment was completed on September 13, 1920, and since that date sufficient work has been done to make sure of the practicability of the method. The problem may therefore be considered solved, in so far as it can be solved with laboratory equipment.

Degree of Subdivision of the Hemi-Hydrate

The first thought was that plasticity is in some way dependent upon the degree of fineness, and that fine grinding might solve the problem. Fine grinding in itself is not new in the industry, and it would seem strange that any increase of plasticity due to it could have passed unobserved. Investigation has shown, however, that all attempts at fine grinding on a practical scale had been conducted in a buhr or tube mill. It has long been known that the half mol of water of crystallization can be "ground out" of gypsum plaster. When it is reduced in either of the above types of mills, the volume of air passing through the mill carries off the water vapor as fast as it is formed by the frictional heat. If the grinding is sufficient to liberate all of the water, the resultant product is soluble anhydrite. This is a peculiar form of anhydrous calcium sulphate and differs from the mineral anhydrite in its great affinity for water. So great is this affinity that a very short exposure of moist air is sufficient to change it back to the hemihydrate. When ground in the usual type of equipment and the frictional heat is not sufficient to liberate the water of crystallization, the size of the grains is not greatly reduced. If the anhydrite is formed, the final product soon absorbs water from the air and the crystals cake into larger aggregates that do not give a plastic plaster.

When calcined gypsum is subjected to grinding under such circumstances that the water is not permitted to escape from the system, an entirely new product results. No satisfactory explanation has yet been evolved, but the fact remains that the product is plastic. Up to a certain limit the degree of plasicity seems to depend upon the duration and speed of grinding.

The plasticimeter described in Bureau of Standards Technologic Paper 169 is not yet adapted to measure the plasticity of unretarded calcined gypsum; the material begins to set before the experiment can be completed. Use has therefore been made of the Carson blotter test, as described in the Transactions of the National Lime Manufacturers' Association for 1916. This has proved quite satisfactory as a means of differentiating between the plasticities of finishing hydrate and masons' hydrate. When tested by this method, this "plastic gypsum" proves to be more plastic than the best lime putty.

Better Strength as Well as Plasticity

Besides improving the plasticity, the process also causes certain changes in other properties of the material. The increased fineness of the plastic gypsum naturally necessitates the use of more water to bring the paste to a given consistency. Yet, in spite of this excess water, the set material will average about 20 per cent stronger than that made from ordinary calcined gypsum. The process slows down the setting reaction somewhat. The time of set of one sample was changed from 12 to 17 minutes by this kind of fine grinding. Commercial calcined gypsum usually deteriorates somewhat on storing. It tends to work "lean" and carry less sand. Samples of this plastic gypsum have been exposed to the air for four months without apparent deterioration of their plasticity.

The process has been applied with equal success to calcined gypsums from Nova Scotia, New York and Virginia. It would seem, therefore, that the original quality of the material is of little importance.

Grinding Work About Doubled

The laboratory results have been accomplished after calcination by grinding the material in a ball mill constructed so that the water vapor could not escape. Commercial calcined gypsum is always

*Reprinted from "Chemical and Metallurgical Engineering," April 27, 1921.

ground during the course of manufacture, either before or after calcination, so that the grinding required to make plastic gypsum does not entail the installation of an extra process. It would seem, however, that the grinding should be done after calcination rather than before to prevent the powder balling up in the mill.

It is probably not essential that a ball mill be used; a buhr mill or tube mill may be satisfactory if there is no loss of water by evaporation during the grinding. It is essential that the product as it leaves the mill shall contain approximately the same quantity of fixed water as commercial calcined gypsum does: 9 parts by weight of water to 136 parts of calcium sulphate, or about 6.2 per cent water.

The duration of grinding required to make plastic gypsum depends upon the kind of equipment used, the fineness and hardness of the material, and the degree of plasticity desired. This problem must be worked out individually by each manufacturer for his particular equipment and material. It is a simple matter to regulate the grinding until the Carson blotter test shows the material to have the desired degree of plasticity. Laboratory experiments indicate that the output will be considerably reduced, perhaps cut in half, if the same equipment is used to make plastic gypsum.

The new product, "plastic gypsum," was demonstrated at the annual meeting of the Gypsum Industries Association on December 15, 1920, but the process of manufacture was not divulged. A patent, covering both the process and the product, has been applied for, and, if granted, will be given to the public for the free use of anyone in the United States. This description of the process is being released at this time in order to give additional protection to the public interest.

Need of Lime in Missouri Is General

ONE OF THE MOST striking conditions noted during the progress of the Missouri soil survey, according to Wm. DeYoung of the Missouri College of Agriculture, is the number of acid soils in the state. Even some of the most fertile soils show a decided need of lime to correct the acidity. Many of these soils, fortunately, are not yet too acid to grow clover. Soils of the highest fertility tend to offset the acid conditions and still produce good crops, but acid soils that are also low in fertility offer scant encouragement to clover and the resultant soil improvement. Besides aiding in the starting and growing of legumes, lime has been found beneficial to later crops in the rotation. There is evident necessity for the more general use of agricultural lime in improving the soils of the state.—Agricultural College Bulletin.

Potash Shales as Fertilizers

Pulverized Raw Shales Yield Potash to Plants—Long Denied by Many Agricultural Scientists

By Dr. William Crocker, University of Chicago

SEVERAL DEPOSITS of potash shale have recently been located in the United States, and probably there are many other deposits distributed over various portions of the country. Considering high shipping and freight rates, it will be of tremendous advantage if we can develop local sources of potash for fertilizer purposes.

There have been two ways suggested of making use of the potash of these shales as fertilizer material. One is to use the shale as material for cement manufacture, and gain the soluble potash as a by-product; the other is to grind the shale finely and apply it directly to the land as a potash source.

Perhaps the most significant deposit that has yet been discovered is that of Cartersville, Ga. These shales run from 8 to 10 per cent potash, and the deposit seems to be almost inexhaustible. These deposits are not distant from great potash-consuming regions of the United States.

We generally speak of two types of soils as being deficient in potash; sandy soils, which are well represented on the South Atlantic coastal plains; and muck soils, of which we have great areas in the Everglades of Florida, and the swamp regions of Virginia and other southern states.

These Carterville shales might be used either in cement making and have the potash as a by-product, or they might be used directly as ground rock material. In either case we would have a compartively short freight haul. Sandy soils have little capacity for holding plant foods, and probably permit much of the soluble fertilizers to be leached out. It is a question whether it would not be well to add the fertilizers in a less soluble form, and to build up the organic content of these soils. Ground potash shales might serve well as a potash source, even in these sandy soils.

Muck soils are said to be deficient in potash, because they furnish such conditions as make it soluble, leading to its being leached from the soil. It is possible that a slightly soluble source of potash would be of advantage in these soils, since the soils themselves would render it sufficiently soluble for the use of the crop, and the nature of the potash would reduce the loss from leaching.

Illinois Experiments Show Possibilities of Raw Shale

We have much to learn through pot and plot experiments concerning the value of these shales when used directly as fertilizers. Bulletin No. 232 of the University of Illinois Agricultural Experiment Station is of great interest in this connection. It shows that certain potash shales, when finely ground and mixed with muck soils deficient in potash, are a most excellent source of potash. Though the potash in these shales is insoluble, it becomes readily available to the crop when added to such soils.

The first part of this bulletin is written by Professor Parr and Mr. Austin, and deals more with the chemical characters of the various potash shales. It points out that shales exist in at least two localities in Illinois and that these shales contain five per cent or more of potash. The chemical and physical characters of those in Union County are such as to make them favorable for the manufacture of cement; for each barrel of cement 70 to 80 cents' worth of potash could be produced by applying methods at present well known. In these shales most of the potash is held in the glauconite or greensand form and it is apparently available for crops, as is the potash of green sands. The Lee County shales bear as high as 5.8 per cent of potash. This is mostly in the feldspathic form and is not, apparently, highly available for crops when the material is simply ground.

The second part of the bulletin is written by Mr. Krey of the State Geological Survey, and has to do with the geological origin and character of the Illinois shales.

The third part, by Professor Robert Stewart, chief in soil fertility, consists of a study of the value of the ground shales as a potash source in muck soils. Professor Stewart says: "This pot-culture work in the greenhouse indicates marked benefit to crops, resulting from applications of shale. The results are so striking and of such possible economic development as to warrant more extended investigations, particularly in the field; and they are of sufficient general interest to make advisable their presentation at this time. *It is quite evident that the potassium in this shale can be directly used by crops in pot cultures under greenhouse conditions.*"

Annual Convention of the Sand-Lime Brick Association

Meeting at Dayton, Ohio, April 26 and 27, Shows Continued Growth in Industry—Much Interesting Discussion of the Sand-Lime Brick Industry's Problems

THE SEVENTEENTH ANNUAL CONVENTION of the Sand-Lime Brick Association, held at Dayton, Ohio, April 26 and 27, was undoubtedly the most successful in the history of the organization; it will live in the memories of those present as one resplendent with good cheer and fellowship, and last but not least, by the exchange of much valuable experience and information. Several new producing companies were admitted to membership in the association and from the numerous papers read and the general discussion and conversation it is evident that the sand-lime brick industry is entering upon a new era of prosperity.

New Labor-Saving Equipment

It will be remembered that at the 1920 convention held at Buffalo, W. H. Crume, of the Crume Brick Co., Dayton, Ohio, delivered a paper in which he described new labor-saving equipment installed at his plant, and also a new grinding and mixing machine with which he was experimenting at that time. The 1921 convention was held in Dayton for the explicit purpose of giving the members a chance to view the installation at the Crume Brick Co., and therefore one of the sessions of the convention was held at the plant proper.

Mr. Crume delivered a very interesting paper on "A Description of New Devices Installed at the Crume Brick Co." The chief problem in this industry, as with others, is the elimination of hand labor and Mr. Crume has succeeded in doing this up to the point where the brick are taken away from the press. This paper is printed elsewhere in this issue.

An inspection of the entire plant took place on the afternoon of April 26, and although the plant was not ready for operation, due to the necessary adjustment of some minor details, it is believed that Mr. Crume has hit upon improvements that may create very radical changes in sand-lime brick manufacture.

Material Handling

A paper on "Material Handling in the Sand-Lime Brick Plant" by W. F. Buell and F. C. Smith of Barber-Greene Co., Aurora, Ill., was read by Mr. Buell. He explained the basic reasons for introducing any labor-saving equipment and also gave quite a comprehensive analysis of costs. An explanation of the various types of material handling machinery was given and their relation to each other in costs and overhead. The talk was supplemented by a motion picture exhibition of the various types of portable loaders made by the Barber-Greene Co. and it proved to be both very interesting and instructive. Mr. Buell brought out very convincingly the necessity of cost data arrived at some expediency for material handling equipment. His paper will be published in a subsequent issue of ROCK PRODUCTS.

Importance of Accurate Compounding

A paper on the "Importance of Accurate Compounding of Ingredients," by Waller Crow, secretary, Schaffer Engineering and Equipment Co., Pittsburgh, Pa., made evident the fact that the sand-lime brick industry is essentially a chemical proposition. He brought out the importance of proper proportioning of materials on a continuous and automatic basis, so as to establish absolute accuracy of the ingredients entering into chemical combination. Such development would provide for great progress in the sand-lime brick industry. Mr. Crow's paper will be treated in a subsequent issue of ROCK PRODUCTS.

Grinding and Mixing

A paper by Ernest C. Johnson, of the Marathon Mill and Machinery Works, Champaign, Ill., treated with the "Marathon Mill for Grinding and Mixing in the Sand-Lime Brick Industry." He first described the use of the mill in the mining industry and then explained its capacity in sand-lime brick manufacture. It is claimed that this machine not only grinds but mixes and kneads, and thoroughly distributes the lime throughout the sand in such a way as to throw a film around each particle of sand so that it makes a perfect binder and produces a strong brick. The size of mill installed at the Crume Brick Co. is 48 in. x 9 ft. and the members were afforded the op-

Members of the Sand-Lime Brick Association at Dayton, Ohio, April 26

portunity of seeing this mill in operation. The mill is fed by the Schaffer poidometers and this new installation aroused much interest and comment.

The principle of the Marathon mill is very simple. The crushing and mixing here is done on a line contact instead of on a point contact as in a ball mill. The mill is a cylinder and is filled with steel rods of varying diameters, these rods tumbling and revolving as the cylinder is turned. The mill takes the place of two wet pans here and only requires the power of one.

Standard Specifications

John L. Jackson, of the Jackson-Church Co., Saginaw, Mich., read the final report of tests and standard specifications for brick as approved by the American Society of Testing Materials. He urged the adoption of the standard size as approved by the A. S. T. M., which is 8 x 2¾ x 2¼-in. The Association approved this standard size brick, and it was unanimously agreed to manufacture this size brick just as soon as the moulds on the presses could be conveniently changed.

Action was suggested towards making the government adopt some one standard for size in brick, but in this connection Warren E. Emley, of the U. S. Bureau of Standards, Washington, D. C., stated that it was up to the manufacturers of brick to adopt and abide by some one standard size, and in the course of time the government would adopt that size as a result.

Lubrication

In a paper on "Lubrication in Sand-Lime Brick Plants," by E. N. Corbin, of the Vacuum Oil Co., Philadelphia, Pa., a very interesting description was given of developments in lubricating problems at the Hummelstown Brownstone Co., Waltonville, Pa., the nature of the material there or any sand-lime brick plant, is such that the lubricating problem is one of great difficulty, due to the abrasive action of the sand when it gets into different types of oilers and grease cups. In fact, in connection with the lubricant the sand makes an ideal cutting medium, and so it was necessary to construct special types of oil feeders for this plant. An explanation was given of the different types of feeders and its use on each particular machine. The feeders were also on display at the convention.

Effect of Grading Sand

A paper by Warren E. Emley and H. V. Johnson, of the U. S. Bureau of Standards, on "The Effect of Grading Sand Upon the Properties of Sand-Lime Brick" was read by Mr. Emley. The paper proved that as the fineness of the sand in the mixture was increased, the modulus of rupture was also increased, as was the percentage of absorption. Mr. Emley exhibited several graphs with his report and the whole will be published in a subsequent issue of Rock Products.

Theory of Surface Areas

A paper on "The Application of the Theory of Surface Areas to Sand-Lime Brick Machinery" by Robert Marshall, of the Canadian Inspecting and Testing Laboratories was read by F. E. Waterman, of the Toronto Brick Co., Toronto, Ont. The author brought out that the grading of surface areas has a very definite relation to the strength of mortars and that the amount of water is a factor of the amount of cement used. He mentioned successive improvements, such as described in the other papers, and showed that each improvement resulted in a more thorough covering of lime to each particle of sand which, of course, results in an increase in strength.†

Officers Elected

The officers elected for the year of 1921 are as follows: President, John L. Jackson, Jackson-Church Co., Saginaw, Mich.; vice-president, W. D. MacFarlane, Winnipeg Brick Co., Winnipeg, Manitoba, Canada; secretary, J. Morely Zander, Saginaw Brick Co., Saginaw, Mich.; treasurer, Allen C. Walton, Hummelstown Brownstone Co., Waltonville, Pa. The Executive Committee consists of H. W. Terry, Toronto, Ont.; I. G. Toepfer, Milwaukee, Wis.; Homer E. Knapp, Rochester, N. Y.; A. S. Bacon, Albany, Ga., and W. T. Carmichael, Willoughby, Ohio.

Improvements in Manufacture of Sand-Lime Brick*

Description of New Devices at Crume Brick Company, Dayton, Ohio

By W. H. Crume
President, Crume Brick Co., Dayton, Ohio

IN DESCRIBING SOME of the new devices that have been installed at the Crume Brick Co.'s factory, I will begin at the sand bank. At our last meeting in Buffalo in February, 1920, in a paper I read at that meeting, mention was made of the bucket loader that we had just installed. Since then, this loader has been equipped with a crawler for the front or digger end, and this is a great improvement on this machine, as we are now able to travel to any place in our bank without sinking down into the sand. This digger or loader will handle the sand we use in a day's run, in two to three hours, and it only requires the attention of the operator with one helper, who breaks down the sand in the hill above occasionaily, and cleans up around the edges of the loader. I will not give a further description of this loader, as there is a paper by W. A. Buell and F. C. Smith, of the Barber-Greene Co., describing its operation, cost, etc.†

The sand dug by this loader is dropped onto a portable belt conveyor 30 ft. long, and this in turn drops on to a 250-ft. semi-portable conveyor. In constructing the semi-portable conveyor we made it up in 12-ft. sections which is interchangeable, the lower part of same being cypress to resist the weather action, and each 12-ft. section is covered with corrugated Armco-iron. The removal of any section of the roof allows for the placing of a hopper for discharging onto the belt. This semi-portable conveyor was designed to follow the face of our bank, so that when it cannot be reached by the length of the digger plus the portable conveyor it can be moved up closer to the bank.

The sand and gravel then goes into an elevator and screen, the oversize going through several small sets of rolls and back onto the sand belt. The sand is then carried by a belt conveyor, set at right angles which deposits it into an elevated steel hopper-shaped bunker. This bunker holds a day's run of sand for 50,000 brick.

Hydrating

Our lime is received in bulk, in carload lots, and it is handled from the car in a special wheelbarrow that holds about 500 lbs. of bulk lime. This is weighed and then wheeled to a platform, which auto-

*Paper delivered to Sand-Lime Brick Association at Dayton, Ohio, on Tuesday, April 26, 1921.

†This will be published in a subsequent issue of Rock Products.

matically operates the lid from our lime hydrator box and also opens the water valve allowing a predetermined amount of water into the hydrator. The bulk lime is not crushed but a grizzly screen is placed above the screw to prevent lumps of too large size getting onto the conveyor flights. This grizzly holds these larger lumps until the steam arising from the lime below strikes these lumps and disintegrates them.

Next to the charging box of the hydrator is an iron tank resting on the concrete wall of the hydrator containing the water for hydration. We utilize heat generated in hydrating the lime to warm water in this tank for the succeeding batch of lime.

The screw of our hydrator is 16 in. in diameter and of extra heavy construction. This travels at an extra low speed of 2 r. p. m. and allows five minutes to each 500-lb. batch of lime. The large screw discharges into a chain bucket elevator of continuous type. This operates at a very slow speed, and the brick housing of this elevator retains the steam through which the elevator passes. At the top of this elevator housing, is an iron vent pipe containing baffle plates to retain the lime, that would otherwise be carried out with the excess steam.

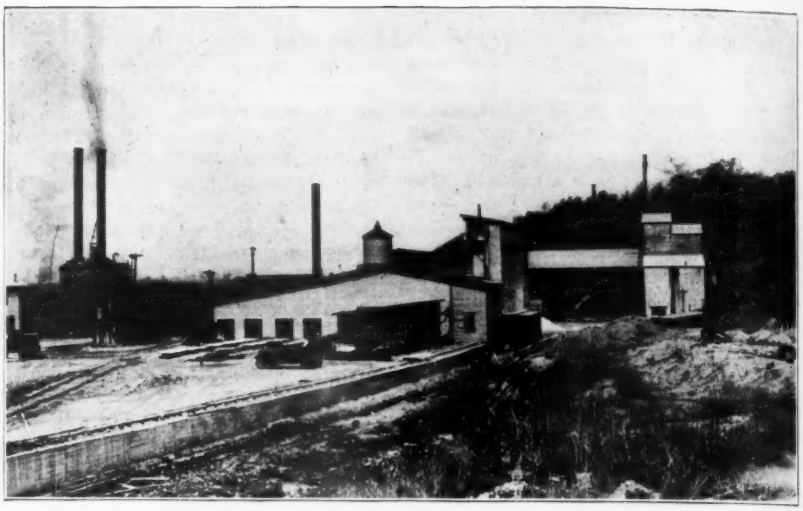
This elevator discharges onto a 9-in. standard screw conveyor, traveling the length of the two lime bins to the center of the steel hopper-shaped bunker, which is paired with the sand bunker in the same structural frame. Each bin is provided with several openings at the top so that the hydrated lime can be dropped through any one of them, and this allows the storage bins to be filled to capacity. These storage bins are about 30 ft. high and together will hold five carloads of hydrated lime. The steel bunker will hold about 20 tons of hydrated lime additional.

To recover the lime from the storage bins and fill the steel hopper, a standard 9-in. screw conveyor is set under the bottom of the storage bins and travels in the opposite direction from the overhead screw, handling the hydrated lime from the storage bins to the same elevator described above. Our lime storage bins are constructed with brick walls, concrete floors and reinforced slab over the top, all openings and doors being of iron or steel plate.

Measuring and Mixing

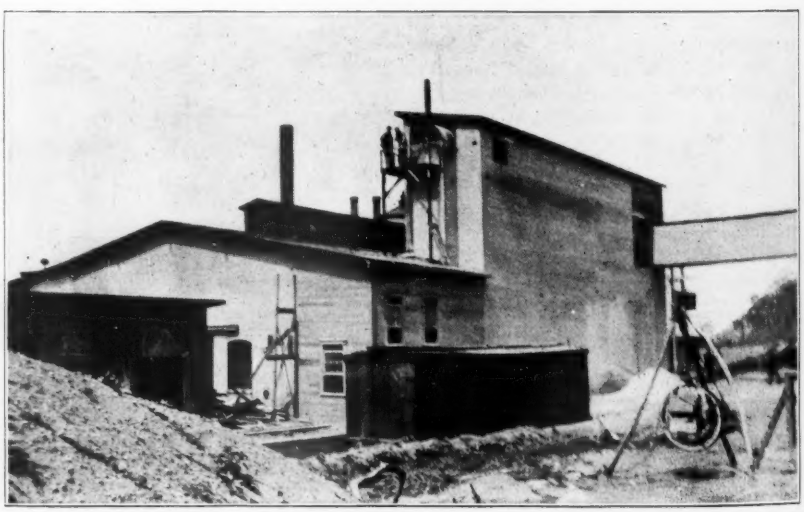
Attached to the hopper of the lime and the sand steel bunkers, are electric vibrators to prevent the materials clogging up the openings of the hoppers.

Underneath each of these bunkers is a Schaffer poidometer, this being an automatic measuring machine which is described in detail in Mr. Crow's paper.‡ The predetermined amount of lime and sand are each fed by the poidometer into a spout that discharges into the Mara-

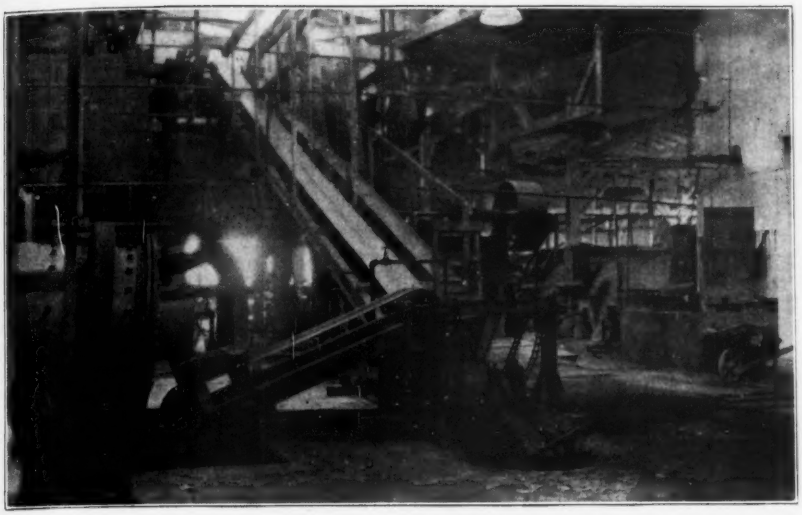


General view of Crume Brick Co., Dayton, Ohio

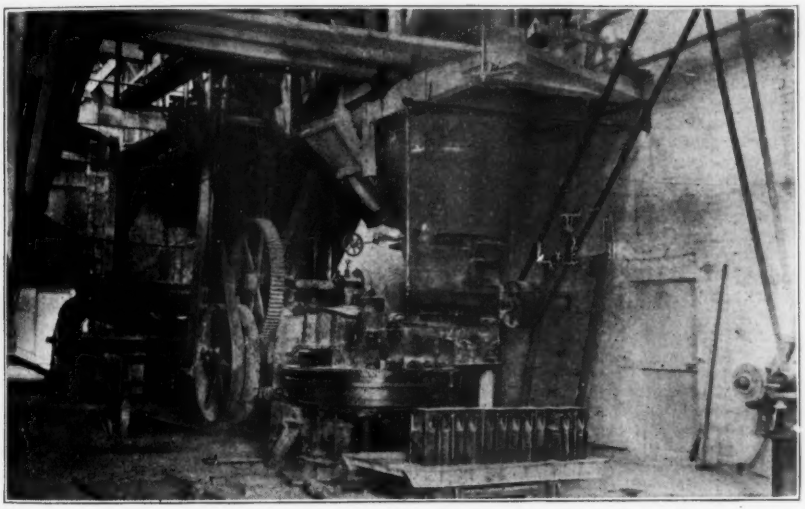
Semi-portable belt conveyor to sand screening unit



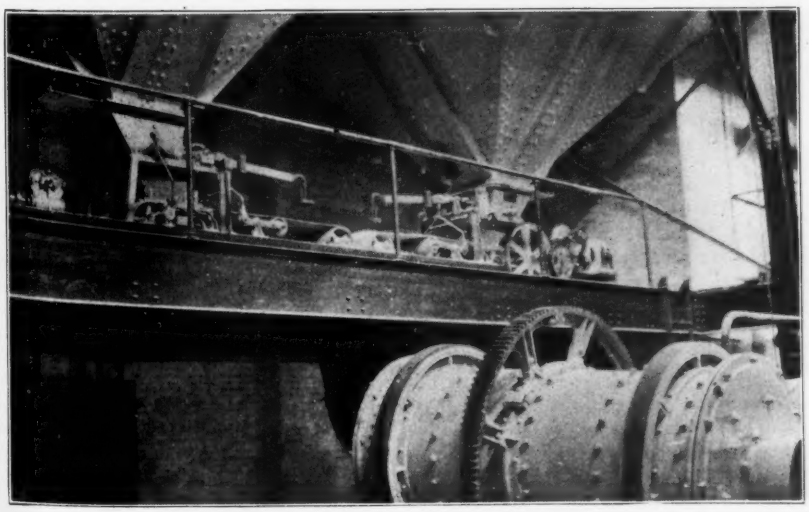
Hydrated lime storage. Overhead belt conveyor from sand plant



Belt conveyors from mill to storage tanks above presses



Storage tanks above rotary press



Schaffer poidometers above Marathon mill below

thon mixing and grinding mill. This mill will be described in detail in Mr. Johnson's paper.‡ The sand and lime mixture is discharged from the Marathon mill onto a belt conveyor, and this conveyor in turn discharges onto a right and left-hand cast-iron screw conveyor, which carries the mixed material to a material hopper above each of the two presses. This material hopper is sufficiently large to carry a reserve supply of mixed material so as to allow a continuous operation of the presses in case of adjustments made on the measuring or mixing machines.

Our presses are both of Saginaw rotary type and the balance of our operations are those commonly used in most of the sand-lime brick factories.

Elimination of Manual Labor

Up to the point of taking the brick away from the press we have practically eliminated manual labor. The lime opertor does shovel into the large barrow, but he has five minutes for each barrow load and this is comparatively easy work.

A year or so ago, we eliminated practically all of our turntables and substituted transfer cars and transfer tracks, and find these much more satisfactory, particularly in handling the green brick from the press, as it eliminates the jolts in passing over the turntables.

We have a speed changing device which I call your attention to, that is valuable in breaking in new press men. This device we connect up with one of our presses and it has a speed variation of from 8 to 24 impressions per minute. We can break in the new men at a slow speed and gradually speed the press up to full speed. In this way we do not interfere with the capacity of the other press.

One other point I want to call your attention to is our method of loading box cars. With the transfer track and car to run the small brick cars through the door of the freight car, and then by short portable track, push these brick cars to the end of the freight car eliminating a great deal of lost motion.

We have under consideration the mechanical loading of both box cars and motor trucks, but as there are a number of hard problems to solve, due largely to different size and construction of box cars, we have not worked out a satisfactory solution.

This paper is written under difficulties, as at the time of writing we have not been able to turn over all of our equipment, much less give a detailed estimate of capacity, wear and tear, etc., but we hope to have this in shape, so that at our next meeting, we can present comparative figures between the old installation and the new; and we may be able to get some of this information and add it to this paper in the printed proceedings.

‡To be published in a subsequent issue.

New York Commission's Ruling in Mineral Aggregate Rate Case

Statement of Commissioner Kellogg, Denying 40 Per Cent Increase on Sand, Gravel, Crushed Stone and Slag, in Full

SUPPLEMENTING the brief news note in the April 23 issue of ROCK PRODUCTS, page 46, we print herewith the full decision of the New York State Public Service Commission, second district, in one of the most important and far-reaching decisions affecting the mineral aggregate industry. This decision establishes a precedent that will prove extremely useful to producers in other states in their fight for lower freight rates. The statement of Commissioner Kellogg, rendering the decision, is as follows:

"In this proceeding the propriety of permitting carriers by rail within this jurisdiction to increase freight rates on crushed stone, sand, gravel and slag 40 per cent is to be determined.

"By its order of July 29, 1920, the Interstate Commerce Commission in a proceeding entitled Ex Parte No. 74 in the Matter of the Application of Carriers in Official Southern and Western Classification Territories for Authority to Increase Rates, authorized an increase in freight rates in the official classification territory of 40 per cent.

"The propriety of extending the general percentage increase to the commodities here involved was seriously questioned, and the opinion of the commission contains the following in reference thereto:

We are not convinced that exceptions should be made at this time from the percentages approved for traffic generally. However, the record does suggest that rates in eastern territory are out of proportion to those in other groups. The carriers have indicated a willingness promptly to readjust rates in cases where hardship results from the general percentage increases, and their special attention is called to these commodities to the end that such action may be taken as the facts may seem to warrant (pp. 250, 251).

"Following the order of the Interstate Commerce Commission the carriers in case No. 7693 applied to this commission for permission to file on short notice tariffs increasing by 40 per cent intrastate freight rates to conform to the order of the Interstate Commerce Commission in Ex Parte No. 74. This commission in that proceeding by its order of August 19, 1920, permitted such filing of tariffs on short notice, but did not assume to approve such rates so made effective or any of them. The following appears in the opinion on this subject:

Sound public policy and commercial interest both dictate that a special permission should be granted, but in granting it the Commission does not indicate its approval or disapproval of the rates contained in the tariff. These will be subject to complaint, investigation, and suspension if the propriety of suspension in any case is made to appear.

"Upon the hearing it was substantially conceded by counsel representing the carriers that the large increase should not apply to certain commodities including those under consideration here. The minutes show the following colloquy between the members of the commission and the representative of the carriers:

COMMISSIONER IRVINE: This situation occurs to me as one that might possibly arise. Suppose the Commission gave you authority to have your rate effective on a few days' notice, and then it turned out that the operation of the increase on some particular commodity would place the rate away beyond what the traffic would bear, although higher than the cost of transportation, and we have perhaps a very large industry whose existence is threatened, even by the temporary enforcement of the rate—

MR. PAULDING: I think that has been recognized by the authorities.

MR. PAULDING: Generally, that is a situation that has been recognized. We all know that crushed stone, and gravel perhaps are commodities, and others are commodities, which could not stand a very large increase, or any increase, perhaps, and move; that the industry would perhaps be destroyed in case of a large increase; but those are matters which I may say very frankly would not require action by the Public Service Commission or Interstate Commerce Commission.

COMMISSIONER IRVINE: I think the Commission should have to itself power to give instantaneous relief in such cases.

MR. PAULDING: I am not dealing with that phase of the question. I am saying those are matters which will be adjusted very promptly. In fact, they are in process of examination now.

"No adjustment, however, has been made after granting special permission to file tariffs on short notice. Almost immediately this commission was in receipt of complaints from the Commission of Highways of the State of New York, the Empire State Contractors Association, representing about 78 road contractors and numerous producers and shippers of the commodities, who ultimately being joined by other shippers, represent upwards of 80 per cent of the commercial tonnage moving by rail.

"Upon receipt of these complaints this commission, by order of August 24, 1920, entered upon a hearing upon the lawfulness of the rates in question and suspended the operation of the tariffs. Subsequent suspension orders were made, the last of which is still in force (April 7).

"The proceeding and the suspension order originally included cement, but as to that commodity this commission, by its order of October 7, 1920, dismissed the proceeding and the filed tariffs in relation thereto thereupon became effective. We have therefore for determination a case involving the propriety of an increase of 40 per cent in the existing rates for transportation of crushed stone, sand, gravel and slag, and in such a case the amendment of section 29 of the Public Service Commission's Law by chapter 240 of the Laws of 1914 provides:

The burden of proof to show that the increase in rate is just and reasonable shall be upon the common carrier.

"About 78 per cent of the total commercial production of these commodities is used in the construction, maintenance and repair of public highways and streets. About three-fourths of that percentage being used upon state highways, the rest by local municipalities.

"They are the lowest grade commodities transported by the railroads.

"During the year 1919-1920 the selling price f.o.b. the shipping point for crushed stone, ranged from 87 cents to $1.41 per ton, for sand and gravel from 42 cents to 90 cents, and for slag from 74 cents to $1.00. In the current year the prices are declining.

"The average load of these commodities is 49 tons per car.

"These commodities move in open-top cars and are not liable to injure the equipment and leave no refuse.

"They cannot be injured in transit and damage claims are very infrequent.

"They move between the middle of April and the middle of November.

"The cars used for this species of transportation have their principal and most valuable use in the transportation of coal. The evidence given clearly shows, although there is some dispute on this subject, that the movement of these commodities from the shipping point to their destination is principally in the direction of the movement of the empty coal cars back to the mines, and further that the movement being from April to November is at a time when the transportation of coal is not at its height and when there is an abundance of cars available for the transportation of these commodities.

"Based upon the prices of 1919 the rate per ton for the average haul varies from 59 to 170 per cent of the value of the commodities. An increase of 40 per cent of the rate would increase this proportion from 82 to 238 per cent of the cost of the commodity at the point of shipment. The cost of transportation bears such a large percentage to the value of the commodity that any large increase in such cost tends directly to prevent the movement of the commodity. Especially in connection with these materials hauls from any substantial distance from the point of production are prohibited and commodities of an inferior quality but of easier access are substituted.

"The fear of the shippers that so startling an increase in cost may lead to the destruction of their business is not without foundation.

"As compared with iron ore, which is a commodity somewhat similar as to its transportation characteristics but much more valuable, the rates for these commodities as now in effect are as much or more per net ton than they are per gross ton of iron ore with the 40 per cent increase added.

"A large amount of evidence was given by the protestants which fairly established the fact that the rates charged for these commodities in other jurisdictions and sections were no higher, and in some cases less, under the increase provided for in Ex Parte No. 74 than those existing in this state without such increase. It further appeared that the general level of freight rates in those jurisdictions was on other commodities substantially higher than with us.

"The carriers base their claim for this increased rate upon three grounds as summarized in their brief:

"(1) That operations under the increase allowed by Ex Parte No. 74 have not yielded a 6 per cent income as was expected but have only produced at the annual rate as a whole of 3.2 per cent.

"(2) That the traffic has moved under the increase of interstate rates and intrastate rates in neighboring jurisdiction.

"(3) That the substantial part of the tonnage is in the direction of the transportation to the coal mines for which the latter commodity there is a greater need of the cars available.

The contention that because more revenue is needed increased rates should be charged for these commodities is not controlling. If so, any increase of rate proposed by a carrier would be justified. The fact that a smaller income is derived from the increase in rates than was expected indicates that the traffic cannot stand up under an indefinite increase, but at some point an economic limit is reached, after which an increase results in a depletion rather than an increase in revenue. This would be the probable effect of the increase of the present rates of the commodities in question, over the very substantial increases which were made thereon during Federal control.

"That the traffic has continued to move in nearby states under increased rates is not a controlling consideration. It appears from the record that at least some substantial portion of this movement was due to the fact that contracts for road construction has already been made and the contractors were under a legal obligation to complete the work.

"The third claim of the carriers that cars needed for transportation of coal from the mines must be diverted to accommodate this traffic and therefore a higher rate is proper is not sustained by the evidence. The contrary appears generally to be the case. The movement is more in the direction of the flow of empty coal cars and in any event is during the season when the demand of cars for coal is much below its peak.

"The evidence hereinbefore referred to bears upon certain principles affecting rate making and indicates that taking into consideration the various characteristics of this class of transportation, these commodities are already bearing their full share of the transportation burden.

"Not only have the carriers failed to sustain the burden of proof showing their right to the requested increase, but the unreasonableness of the proposed increase appears conclusively upon the record. An order should therefore be entered canceling the tariffs filed as to these commodities and disallowing the proposed increase of rates."

Producers' Argument in the New York State Rate Case

FOLLOWING is the outline of the argument used by the New York State producers of crushed stone, sand, gravel and slag in their brief:

"1. The burden of proof is on the respondents.

"2. Revenue considerations alone afford no basis for the determination of the reasonableness of rates on these commodities and are no justification of the proposed increase.

"3. Continued movement is no criterion of a reasonable rate.

"4. The protestants, their interest in and their right to have determined the reasonableness of the rates on crushed stone, sand, gravel and slag.

"5. The reasonableness of the rates on these commodities is to be determined by the usual tests:

"(a) The value of the commodity and its transportation characteristics.

"Applied to the proposed rates, it shows that they should not bear so high a percentage to the initial value.

"Applied to the present rates, it shows that these commodities are the lowest grade transported by the carriers; load heavily per car; move in open-top cars; move in summer months when cost of operation is lowest; release the equipment to the coal trade in winter; there is no risk in transportation; they do no damage to equipment; require no special or expedited service; detention of equipment is very slight and cars are loaded by the shipper and are unloaded by the consignee.

"(b) A very great portion of the movement is in the general direction of the empty car haul.

"Applied to the present rates, it shows them to be ample considering the favorable transportation conditions involved.

"Applied to the proposed rates, it shows that this furnishes a very desirable and profitable traffic.

"(c) The tonnage large and regular.

"Under the proposed rates, the tonnage would decrease. A social economic waste would be involved, due to the development of local deposits.

"On the present rates, the industry would thrive and grow.

"(d) Revenue per car and per car mile.

"Applied to the proposed rates, it shows that the return would exceed that earned by many other commodities which are of greater value.

"Applied to the present rates, it shows that they are now returning revenue which compares very favorably with that earned by other traffic.

"(e) Comparison of rates in New York State with rates on the same commodities in other sections of the country which are higher rated territories and which rates have been approved by rate regulating commissions.

"Applied to the proposed rates, it shows that they would be grossly excessive.

"Applied to the present rates, it shows that they are already as high or higher than those in other territories.

"(f) Comparisons with rates on iron ore in this immediate territory.

"Applied to the proposed rates, it shows they would be unreasonably high.

"Applied to the present rates, it shows that they are already bearing their full share of the transportation burden.

"6. Used in a work of great social value.

"7. Other facts to be borne in mind.

"8. It is charged that the rates complained of are unreasonable, unjust and unduly prejudicial to these commodities and subject the State Commission of Highways to the payment of unjust and unreasonable charges to its disadvantage."

Meeting to Promote Use of Mineral Fertilizers

Association of Natural Soil Fertility Resources Holds Session in Chicago—Lime in Relation to Other Mineral Fertilizers

DR. WM. CROCKER, Professor of Plant Physiology at the University of Chicago and agricultural adviser of the Association, was called on for a talk on "Some Features of the Mineral Fertilizer Program."

Dr. Crocker said: "To show the changes that are coming about in fertilizer practices, it has been only a few years since we realized, for instance, that the soil and certain crops, animals and men, need lime. Fifteen or twenty years ago lime stood in a very poor position in agriculture; now its importance is beginning to be recognized, but only partially, at that.

"Regarding the need of the soils for lime, I might say that on the average about 800 pounds of lime—certainly that much in humid regions—leach out of the soil in a year. Among lime-loving crops, alfalfa takes about 450 pounds of lime per year. To supply this need of the crop and make up for the amount that leaches out, we need to add tremendous amounts of lime. At the first meeting of this Association I believe I made the statement that there should be 25,000,000 tons of limestone added to our agricultural lands, which are already deficient in lime or are acid. Since then I have looked up the matter more fully and would say that perhaps 50,000,000 tons are needed to keep our lands in the best condition. A few months later I might put the estimation still higher. In fact, we haven't the data to compute the actual amount, but we have enough data to know that we need many times the amount used.

"And we must not think that satisfying the soil and the plant is sufficient. Animals and men must receive their share. We all know that animals grown in limestone regions are the best physical specimens—take for example the horses in Kentucky and the export cattle raised in Virginia in limestone valleys. In fact, the great significance of lime in the animal and, finally, in man, can hardly be over-emphasized.

"A set of experiments along this line has been carried on at Wisconsin; the breeding cattle used in the experiments aborted regularly on the diet used, but the addition of any form of lime to the ration was enough to prevent abortion and produce healthy offspring. We are always talking about poor teeth. This is probably related to shortage of limestone—and the human race has made this worse by taking out the good minerals in the preparation of their food. We are just on the verge of finding out how much mineral nutrition means to plants and animals.

"This Association is made up of a group of men who are producing one or more of certain plant nutrients, and the idea is to combine these in various ways to supply the needs of various soils and crops. The commercial fertilizer people are putting in their products every element that might be needed—consequently the farmer pays for elements that may not be needed on his soil or crop. If the method is carried out that this Association proposes, we shall add only the necessary things in the different regions for the given crops that we care to grow. In some regions combinations of lime, phosphorus, sulphur or potash, will be needed; in others, only one of these. The aim should be to find out the needs of localities and crops and distribute our products accordingly.

"Another thing the Association of Natural Soil Fertility Resources stands for is to get the plant foods to the farmer at a minimum cost, and this will result from supplying only what is needed, and from putting less money into manufacturing the product. Where there is a long haul and freight must be considered, there may be needed more concentrated products than the minerals in their natural state. For instance, in some of the states west of the Mississippi which are distant from all the phosphate fields, something like the new 'treble phosphate' may be required, which supplies three times as much phosphorus as does acid phosphate and twice as much as ground phosphate.

"Another factor to be considered is availability of the plant food to plants. We are learning that after all not in all cases does the material need to be very soluble in order to be available to plants. Solubility is one question, availability is another. The plant has a way of getting materials that is not shown up by scientific methods of determining availability. In Illinois they have found two deposits of potash shales, in Union and in Lee Counties. The Lee County shale bears 5.8 per cent of potash—higher than the other, but apparently not available to plants. In Union County they have a 5 per cent potash shale, and this is very available to the plant—in fact, it turned out to be the best potash source to use. We are learning a great deal about how to apply these products in order to make them available. The Illinois group have shown the effect of organic matter upon availability.

"I think this briefly sketches what I understand are the main virtues of this Association."

A. Vere Martin, treasurer of the Association and vice-president of the Lake State Bank, Chicago, addressed the meeting on the value of association work in forwarding a movement. Mr. Martin, who was originally a farmer, is now, in addition to his banking duties, a hardware manufacturer and has been for six years the president of the Hardware Club.

Nathan C. Rockwood, editor of ROCK PRODUCTS, spoke briefly on tendencies of the fertilizer industry. After speaking of the firm foundation on which the Association is based and the beginning it has made, Mr. Rockwood continued:

"There never was a greater field of exploration than this of agriculture, about which apparently scientists have accumulated knowledge and literature in keeping with its antiquity and its importance. Yet, like our knowledge of many functions of the human body, our knowledge of agricultural chemistry and bacteriology is far from complete or even really definite, if I am correctly informed.

"The reason doubtless is that we are dealing with the most elusive thing in the universe to explain—the germ of life itself. Possibly in this field of agriculture really lies the whole secret of life of all kinds.

"They tell us that it is possible to compound a soil of the most perfect proportions of mineral elements, yet it will remain sterile indefinitely until, in some way by no means fully understood, it becomes impregnated with microscopic germs of life. Once these appear, a never-ending change in the character of the minerals begins.

"It is, then, in this field of agricultural bacteriology that you must look for developments of value to you in a com-

mercial way. These microscopic chemists in nature's laboratory are the workmen who are going to transform your pulverized limestone, rock phosphate, gypsum and shale from merely rock minerals into fertilizers, just as surely as the digesters, vats and machinery of a fertilizer factory convert raw materials into fertilizer.

"Personally, I believe that the day will come when acid phosphate, ammonium sulphate, and so-called chemical fertilizers will be classed as soil medicines, rather than soil builders. They will fill somewhat the same place in agricultural science that cathartics do in medical science. They will be considered very useful on certain occasions and in small doses, but mighty poor to depend upon for a permanently healthful condition."

Frank B. White, agricultural publisher, spoke on what has been and can be accomplished by co-operative work with farmers.

H. H. MacDonald, secretary of the Association, read quotations from a few of the many enthusiastic letters that have been received from agricultural college men, and stated that a booklet in regard to the mineral fertilizer program would shortly be prepared — probably of such size it could be used as an envelope stuffer by member companies and others interested.

C. A. Tupper, chairman of the Association, said: "Last fall, when we called together in Chicago a small group of people to talk about the possibilities of an association of this kind, we had no idea of the vast amount of interest which would be aroused in all parts of the country within such a relatively short time. Work of this sort must necessarily be slow. I myself would deplore the too rapid development of an idea and an organization of this kind. I believe thoroughly that slow, substantial growth is best for anyone or any thing, whether it is a person, an animal, an institution, or an association.

"We want to keep our feet on the ground all of the time and not fly off at any tangent or exploit any suddenly conceived idea which it will be impossible for us to follow out. Business conditions at present are rather trying, but I believe that by fall, at the latest, the country will be at the beginning of a great business boom and entering upon a period of at least six or seven years of unexampled prosperity. By that time we can have this movement well under way, arrange for a national meeting, and inaugurate a program of very large proportions."

An interesting informal discussion followed as to best methods of getting the mineral fertilizer program before the farmer — whether through the county agent, the dealer, the farm papers, or by work directly among the farmers.

Building Material Producers Have Freight Rate Conference With the President

THE FIRST driving attack by organized shippers against high freight rates as impeding national progress has culminated in an agreement for a joint conference in Washington, D. C., May 13 between railway executives, Interstate Commerce Commission members, and producers and shippers of basic building materials, according to an Associated Press dispatch to the Chicago "Tribune."

Quick Action Sought

The meeting was arranged after the producers group, representing all the larger building materials manufacturers' associations, had carried direct to President Harding their demand for prompt action. The situation was urgent, they contended, and would not brook "the ordinary slow and expensive processes" of appeal for relief through the Interstate Commerce Commission.

The President is said to have approved the conference plan, which contemplates bringing the rate problem to an issue and getting construction work throughout the country on the move again through concessions in rates by the carriers and reduction in prices by materials producers to stimulate buying immediately.

Attempts with Roads Failed

The building material producers represent concerns which supply sand, brick, lumber, gravel, tiles, clay products and other building materials. They asserted that their negotiations through the general freight agents of the railroads had failed, although the agents were said to have expressed eagerness to get the business at a lower figure.

The producers then joined forces in an appeal to the President, contending that freight rates were holding up building.

In outlining their case to President Harding the material men said: "Irrespective of the fact that there is an unprecedented demand for all kinds of construction, the building and road-making industries are at a standstill, chiefly because of excessive freight rates applying to that class of materials which are heavy loading and of low value."

Those Attending Conference

Among the building materials organizations represented in the conference were the National Association of Sand and Gravel Producers, by E. Guy Sutton, Indianapolis, Ind.; National Paving Brick Manufacturers, J. G. Barbour, Canton, Ohio; American Face Brick Association, H. E. Stringer, Washington, D. C.; Hollow Building Tile Association, H. M. Keasby and W. M. Councill of New York, N. Y.; National Lumber Manufacturers' Association, Frank Carnahan, Washington, D. C.; National Crushed Stone Association, A. P. Sandles, Columbus, Ohio, and the Gypsum Industries Association, W. D. Lindsay, Chicago, Ill.

Railways Accept a Reduction Without Appeal to Courts

W. L. SPORBORG, president of the Rock Cut Stone Co., Syracuse, N. Y., chairman of the producers' committee in the New York State rate case, informs us under date of April 29:

"Of course there has been the question as to further action by the carriers and that was not settled until today. The New York Legislature has amended the Public Service Commission law to such effect that the Public Service Commission, Second District of New York, ceased to exist and a new commission with broader powers replaced the former commission. The New York rate case was heard, of course, by the former commission and one of its last acts was the handing down of the order in the case. The new commission entered upon its duties on April 25.

"The carriers applied to the new commission on or about April 26 for permission to reopen the case and for a rehearing of the same. On the 28th, yesterday, the commission refused to grant the prayer of the carriers for a rehearing, and this morning the commission has received from some of the railroads supplements canceling the tariff supplements filed last August, providing for the 40 per cent increase in rates. You understand, in New York the carriers filed supplements providing advances of 40 per cent on these rates, applying on traffic moving wholly within the State of New York, to become effective August 26th. It was these supplements that were suspended, the end of the suspension period being April 30th. The burden of proof was on the carriers to show that the 40 per cent increase was just and reasonable, and the case was as to that determination.

"Now that the carriers have obeyed the order of the Commission, and withdrawn their tariffs filed last August proposing to advance rates, it seems to us we may conclude they do not propose to take the case into Federal Court."

Sound Advice for Promoting Use of Concrete Aggregates

THE NEW SECRETARY of the Illinois Concrete Aggregate Association has sent his members such pertinent suggestions for meeting the present business stagnation that it wouldn't be right not to pass them on to the whole fraternity. Here they are:

"From various important sources comes the growing impression that normal business is very near at hand. Probably none of us will live to see the abnormal business conditions we have just passed through, but the time is here when business judgment, together with good service, good quality and fair prices will bring their usual normal rewards. It is the time to look to the future rather than the present and to lay the foundation of sound and friendly relations not only with your customers but with your competitors. They will judge you for a long time by your actions in this crisis of readjustment. Your fairness is being tested and your business methods are being recorded.

"There are rumors that freight rates may soon be reduced. There are conflicting rumors about what the state road-building authorities will do, but nothing is definite. The state had advertised for bids on road-building equipment and road-building aggregate, but no word has come that purchases have actually been made. It seems that the state might save money by assisting in the effort to reduce freight rates than to enter into competition with its own citizens in road building. Surely it is more becoming for the state to aid and strengthen an industry than to wreck it.

"In the meantime, what are you doing to increase the use of aggregate in your territory? You know how aggressive the cement manufacturers are and what have been the results of their efforts during the past few years. The following suggestions are worth thousands of dollars to some of our members and should be of some value to everyone:

"Get or make a map of your city or village and study it to learn—

"1. What streets should be connected or cut through.

"2. What new streets are needed.

"3. What new alleys are needed.

"4. What sidewalks are needed.

"5. What repairs to streets, alleys and sidewalks are needed.

"When you have a list of these needed improvements, it is not difficult to promote the work by

"1. Presenting the facts to the proper officials.

"2. Presenting the facts to the property owners.

"3. Starting petitions among property owners to have the work done.

"To develop additional business, you must be your own promoter and your salesmen will soon learn to help. Cultivate village and highway officials, offer your advice and assistance and get the help of your contractor friends. It means business for them as well as for you. Your secretary has had some experience on this kind of work and is ready to help."

United States Gypsum Active on Chicago Curb

UNITED STATES GYPSUM is showing up strong on the Chicago curb, having advanced about three points in a week. The buying is said to be based on the bright prospects of a market for its products when building starts, with the possibility of an expansion program now rumored to be under consideration by officials of the company.

The report of the United States Gypsum Co. for the year ended December 31, 1920, shows net profits after charges and federal taxes of $1,705,210, equivalent after preferred dividends to 32.64 per cent on the $3,948,693 common stock outstanding, compared with $1,076,110, or 17.37 per cent, in 1919. The investment in plant, etc., was increased $1,674,419 and capacity increased about 50 per cent.

Testing Gypsum as Fertilizer

ONE OF THE PROJECTS which the Agricultural Extension Service is devoting some attention during the present season is the testing of gypsum as a fertilizer for various crops in Los Angeles County, Calif. A number of test plots have been laid out with annual crops and forage crops, and it is desired to have some plots with the fruit crops, particularly with citrus fruits. Persons interested in conducting test plots where gypsum is used as a fertilizer under the supervision of the Agricultural Extension Service are requested to get in touch with the office of the Farm Advisor, Room 361, Court House, Owensworth, Calif.

Freight Rates on Agricultural Marl Reduced in Virginia

THE STATE CORPORATION COMMISSION of Virginia has entered an order reducing the freight rates on agricultural marl, effective May 1, 1921, thereby putting the rates back to where they were a year ago. The rates to become effective will be as follows on each railroad after May 1, 1921:

5	to	30	miles	$0.50
30	to	50	miles	0.60
50	to	90	miles	0.70
90	to	100	miles	0.80
100	to	120	miles	0.90
120	to	130	miles	1.00
130	to	170	miles	1.10
170	to	205	miles	1.20
205	to	225	miles	1.30

Indiana May Stop Removal of Sand from Lake Michigan

WHOLESALE REMOVAL of sand from the parts of Lake Michigan belonging to Indiana by corporations for sale in Chicago and elsewhere may be stopped by court action, according to an opinion submitted to Richard Lieber, director of the Indiana State Conservation Department, by Attorney General U. S. Lesh, recently. Letters sent to the attorney general by Mr. Lieber alleged that the Great Lakes Sand Co., operating under a lease, and the Construction Materials Co., of Gary, Ind., are removing large quantities of sand from the Indiana part of the lake with boats equipped with "sand suckers."

Pennsylvania Sand Company Enlarges Truck Fleet

ANNOUNCEMENT was recently made by officials of the Iron City Sand Co. that they had added 23 motor trucks to their equipment to facilitate prompt delivery of their material in Pittsburgh.

The company operates dredges in the Allegheny and Monongahela Rivers both winter and summer, thus assuring a steady flow of sand and gravel into the Pittsburgh market. The sand and gravel is transported on the river by barges.

Cement Operations at Victorville, Calif.

CEMENT PRODUCTION at Victorville, Calif., is being developed to a high point and orders on hand insure plant capacity for some months to come. The Southwestern Portland Cement Co. is now shipping on an average of 2,000 barrels of material per day, or close to normal plant output. The Golden State Cement Co. has increased shipments about 25 per cent during the past month, and greater distribution is anticipated.

Crushed Stone and Gravel Prices Reduced in San Francisco

AS A RESULT of several conferences on the subject of price reductions and the stipulation of building activity, the board of directors of the General Contractors of San Francisco announce that a reduction of 10 per cent has been made in crushed rock and gravel by the local producers.

Community Owned Plants Bill Passes California Senate

THE CALIFORNIA SENATE, on April 26, passed a bill permitting counties, cities and irrigation districts to acquire and operate cement and rock quarrying plants. The bill was passed by a vote of 22 to 18.

Editorial Comment

Lime Possibilities

The editor's dream of millions in the sale of household lime may seem far-fetched to some, but think it over, you doubting Thomases, and see if the problem of making lime a household necessity is after all so much different from that solved by promoters of a score or more of other commodities, which have achieved that place. Lime on every kitchen garden alone would mount to a tremendous tonnage in the aggregate. And about the only reason it isn't used on every kitchen garden now is because the average householder or home-owner doesn't really know it is *good* for his garden. One might almost say the average person on the street does not know what *lime* actually is or looks like, or what use is made of it other than for mortar and plaster.

The whole story of lime is so interesting that a strong popular appeal could be made. It's like the old riddle of which came first the hen or the egg? Lime dissolved in sea water is taken up by marine life to form shells and bones. Eventually these shells and bones, etc., are deposited in the sea, filled up with silt and cemented together. Changes take place in the surface of the earth and these beds come to form hills and mountains of *limestone*. The streams flowing through them dissolve the lime and return it to the sea. Which came first, the marine life or the limestone?

Anyhow there is no more important mineral element in all animal life than calcium—the basis of lime. It literally put the back-bone in the first animal life on this earth of ours, and if we didn't get it in *our foods* we wouldn't have any back-bone. The men who supply the wherewithal to make human back-bones ought to have a little bit of faith in their business, hadn't they?

To the President!

President Harding is a busy man. He has problems to solve involving the reparation Germany must make to the Allies and recognition Japan must give our country in the mandate for the Island of Yap. Yet the President also happens to come from a part of the country where limestone quarrying is done. He knows there is such a thing as a quarry and gravel-pit industry. Indeed, some of his closest friends are in this business.

Consequently, since the Interstate Commerce Commission and some of the other Government bureaus have been inclined to ignore this mineral aggregate industry, the recognition the President has given it should have a wholesome effect. It was through President Harding's intercession that a conference was finally arranged for May 13 between representatives of the building material industries and the railway executives.

The only fly in the ointment is that for some unexplained reason the party is going to be too big. It might have been politic, but it certainly does not strengthen the mineral aggregate case, to have the lumber, brick and other material interests with it in this conference. In the first place the mineral aggregate industry is strong enough to stand on its own feet; and in the second place its freight problem is peculiar and not by any means even similar to that of the other building material products. The record of individual state cases already decided shows that it is generally recognized as an industry which should receive special recognition for its traffic problem.

According to most recent advices the mineral aggregate representatives will ask for the abolition of all the advances made last summer. It is said that the railway executives are anxious to confine the conference to producers of "road materials" and thus recognize the merits of the case of mineral aggregates as distinct from that of other building materials such as lumber.

The original rate hearing on the 40 per cent advance in Washington last summer, and the open-top car hearing, were both seriously damaged for mineral aggregate producers because some of these other industries were rung in.

Promoting Agriculture

An industry that furnishes the necessary materials for efficient agriculture is founded on the oldest institution in civilization, its most important institution and its only permanent institution, for agriculture furnishes us with food and clothing, the only real essentials to human life. Just at present there is a slump in industries which depend on purchases by farmers, but it is only the most temporary kind of a slump. The wise producer has his eyes on the future and what the increasing needs of a constantly depleted soil mean, rather than on the prospects of doing this year as large a business as he did last year.

While it probably is true that farmers as a class are more favored by both state and federal governments than any other class of citizens there is some justification for it because experience has shown time and again that when the farmer is prosperous, the country is also prosperous and the ship of state goes ahead under full sail. Consequently we are all interested in seeing the farmer get a fair deal, both in a large way from the general public, and individually from each producer or manufacturer who sells him anything.

Accident Prevention

Quarry Cars and Haulage—Tracks

(Prepared for Rock Products by the Engineering Department of the National Safety Council)

MANY DERAILMENTS, overturned cars, and other accidents in quarries are frequently due to bad track conditions, rather than to any defect in rolling stock, it has been found through investigations by the National Safety Council. Ten to 30-ton locomotives, within a generation, have taken the place of car pushers and mules, and the original ½-ton tub has been replaced by 6-ton cars. Main haulage-ways, especially should be kept clean of loose material and the track maintained in good, well-ballasted condition. Where 20-ton or heavier locomotives are used most companies now believe it economical to use 60-lb. (per yard) steel rails; some use 80-lb. rails. A good track can be maintained only on good, solid wooden cross ties, properly laid.

Track Clearance

Where roof conditions permit, it undoubtedly is safer to provide clearance on both sides of track. Where passageways are rather narrow, it is safer to lay the track along one edge and provide clearance only on one side of track. This system provides a safe passageway for pedestrians, and also safety for the train crew.

Frogs and Switches

All frogs and switches on main haulage ways should be guarded. Wood or metal guard blocks may be used; it is considered better, however, to use dirt or clay for tamping the switches and frogs. Switches should throw parallel to track rather than at right angles. Where switches throw at right angles to the track the switch lever should be a sufficient distance from track so that switchmen will not be struck by passing cars. Some operators have extended the switch rods on their haulage ways into shelter holes and have the operating levers placed in the shelter holes. This method is desirable because many accidents occur when cars are derailed at switches. The use of a switch stand placed in a shelter hole would seem to be the most desirable arrangement.

Inclines

It is of particular importance that all incline tracks (planes and slopes) be kept in good state of repair so that cars will not become derailed while ascending or descending the incline. The track should be gone over daily and cleared of pieces of material which have fallen from the cars. The rollers or idlers which support the rope should be kept free to revolve as these also become blocked by fallen pieces of material, causing wear on the rope.

To prevent the track creeping or sliding down hill on steep inclines, every second or third tie should be long enough to extend across track way and be anchored in the side of the excavation, or be braced by posts firmly set in the ground, or else otherwise securely fastened. Though many slopes or inclines are of the three-rail type, the four-rail or double-track type is more satisfactory and safer to operate. Three-rail tracks should have a long parting in the center.

On all planes and slopes a derailing device should be provided for the protection of workmen at bottom of incline. There should be a shelter hole in which the handle for operating the derailer is placed. These derailers should be normally in open position, it being necessary for the foot tender to hold derailer in closed position while cars are passing over it. It is advisable for operator to stop trip of cars ahead of derailer and then proceed only after signal from foot tender that derailer is in position. The derailing device should be from 50 to 80 ft. from bottom of incline and so arranged that cars will be turned into a wall or pillar.

Automatic stop blocks should be placed at the top of slopes and surface planes where the rope is disconnected from the trip. A positive derail also should be placed near the top.

Car stops placed at intervals along incline are suggested by some. These may be arranged to permit cars to be pulled up the incline, but prevent them from descending. Of course, on the return or empty track, such car stops cannot be used. Derailers operated by a lever may be provided on such tracks.

The Foreman's Place in Accident Prevention

By C. W. Price, General Manager of the National Safety Council

THE MOST SUCCESSFUL FOREMAN is the one whose department shows the largest production at the lowest relative cost. All foremen want to be successful and therefore strive to maintain a high standard of production and to keep the cost within a fixed estimate.

Accidents reduce the rate and increase the cost of production. It is obvious, then, that to be most successful the foreman must eliminate accidents in his department. Each accident has a direct effect upon the efficiency of his organization. In a small department, say of 10 men, if one man is disabled on account of injury, the production will be reduced by one-tenth. Even with a new workman in his place—and it often takes several days to secure another workman—the production may not reach normal for several days or weeks. If this is true of a small department, it is likewise true of a large department in the same ratio as the number of men disabled bears to the number of men employed.

Progressive employers have come to realize that in every department the foreman is the "key-man." In the eyes of the workmen, the foreman represents the company. Plans and policies formulated by the manager or superintendent are ineffectual and useless unless carried out wholeheartedly by each foreman in his department.

Foreman the Determining Factor

The workman's attitude toward safety depends absolutely on the attitude of the foreman. If he is indifferent, the men will be indifferent. But if he believes in safety, if by what he says and does each day he convinces his men that he is in earnest and is doing everything in his power to protect them, he will get his men with him. Just as the corporals more than the captain determine the morale of a military company, so the foreman and his subforemen determine the spirit of safety in his department.

Discipline has a place in safety work, but in the long run a foreman must lead his men into safety, not drive them.

(To be continued)

Seventy-Five Percent

Of All Accidents Can Be Prevented

THAT IS A BROAD STATEMENT but one that is based on fact. Great numbers of industrial concerns have reduced accidents by 75 per cent and as a result are saving hundreds of thousands of dollars annually. In each case, this saving has been effected only during the period of time that the organization has been engaged in active accident prevention work. The United States Shipbuilding Board in its report for 1919 showed a saving of ten and one-half million dollars—through the intensive application of National Safety Council accident prevention methods.

Accident prevention is not a one-man job—nor a one-plant job. Its success depends largely upon the variety and amount of accident prevention experience which you are able to acquire and introduce into your plant.

The National Safety Council will deliver into your hands each week a unit of educational material designed to effect the greatest reductions—a unit of material representing the combined experience of four thousand of the most progressive industrial concerns in America.

A letter to our business division requesting details entails no obligation on your part.

NATIONAL SAFETY COUNCIL

Co-operative Non-Commercial
168 N. Michigan Avenue, Chicago, Ill.

General Market News

Conditions in Lehigh Valley Cement District

THE PAST FORTNIGHT shows no material change in the situation in the matter of production in the cement district in the Lehigh Valley section of Pennsylvania. Mills now operating continue to forge ahead under good output and the gradual resumption of construction operations is having the effect of noticeably increased shipments from this district. Moreover, road building looms up as an important outlet for cement, and forthcoming spring and summer work in Eastern territory, as well as in other sections, will be of no mean scope. Cement for foreign account is still at low ebb, and but minor shipments are going out for this purpose. If it were not for this fact it is likely that the majority of plants would be entering upon the same busy season that has prevailed at this time in former years.

The larger cities in the East are commencing to absorb greater quantities of cement; dealers are placing increased orders for requirements in anticipation of spring building, and stocking up is now going forward at a good pace. Contractors and road builders are assuming more prominence in the market, and the call from these interests shows a healthy character. Prices remain uniform, and existing levels seem destined to hold for some time. At New York, dealers are asking $2.80 a barrel, net, without bags, delivered on the job to any point in the Greater city. The bag rebate question, referred to in recent issues of Rock Products, has been settled by the establishment of a 10-cent refund, as compared with a former price of 25 cents. Brooklyn borough is drawing quite heavily on the supply at the present time, due to the large number of homes now being erected in this section.

New England material dealers report a better call for cement, and noticeably increased since the settling of the strike in the local building trades; the settlement has come about by employers adopting an "open shop" basis of operation. At Boston, the material is priced at $4.20 a barrel in cloth sacks, and at $4.05 in paper, delivered. There is stability in these levels, and no immediate change seems likely. Gypsum partition blocks are in quite good demand here at the present time, selling at 20 cents per sq. ft. for 3-in. size, and 24 cents for 4-in. Common hydrated lime is selling at $23.50 a ton in paper, and hydrate finishing lime, $26.50, delivered. Portland cement at Providence, R. I., is being sold at $4.60 per barrel, with bag rebate of 90 cents for the four sacks. Lime, in 180-pound net barrels, is priced at $4.50, delivered on the job. Hydrated lime in 50-pound bags is selling for 85 cents a bag locally.

The Atlas Portland Cement Co. has had a force of men cleaning up at its No. 2 mill at Northampton, Pa., and it is likely that production will be resumed here at an early date; the mill is one of the largest in this section, and during the idle period of the weeks past a number of necessary improvements have been made. As stated in the last issue of Rock Products, the No. 4 mill of the company at this place, the largest of the plants, is in full operation. The Nazareth Cement Co., Nazareth, Pa., has been awarded a contract for furnishing cement for a new six-mile concrete highway near Bangor. Several thousand barrels will be required for this work. The Alpha Portland Cement Co. has completed plans for the erection of a new one and two-story building on Hamilton Street, Easton, Pa., for private service, estimated to cost about $30,000. The company will also build a new one-story storage structure at Jamesville, N. Y., 20 x 120 ft.

Province of Ontario May Erect a Cement Plant

A BILL appropriating $1,000,000 for the erection of a provincial cement plant has been passed by the Ontario legislature. Hon. F. C. Biggs, Minister of Public Works, is considering several sites. It is estimated that cement can be produced at least a dollar cheaper than the present market price of $3.20 per barrel.

The minister stated that it was the intention to proceed with the erection of a one-unit plant having a capacity of 300,000 barrels per year. The object was to supply cement at cost for municipal development, but if the municipalities did not place their orders with the government the total output could be used in road construction. It was estimated that the municipalities outside of Toronto required from 200,000 to 300,000 barrels of cement a year, while Toronto required from 50,000 to 60,000 barrels annually. If the demand justified it the capacity of the new mill would be doubled.

Mr. Biggs gave the following reasons for establishing the plant:

(1) During the past year the province had been forced to cancel contracts for bridges, culverts and concrete roads because it was unable to secure sufficient supplies of cement.

(2) A 350-pound barrel cost $3.20 in Ontario, while a 378-pound barrel cost only $2.20 in the United States.

(3) The government was confident it could manufacture and sell cement at a price lower than either of these figures.

(4) A modern plant with up-to-date machinery could produce cement superior in quality to the product at present being offered on the Canadian market.

Mr. Biggs stated that the government had no desire to enter into competition with private concerns on the open market, but that it merely desired to provide a reliable source of supply for municipal and provincial needs.

Executive Committee of the National Crushed Stone Association Meets

AT A RECENT EXECUTIVE COMMITTEE MEETING of the National Crushed Stone Association, Secretary A. P. Sandles was asked to notify quarrymen that the minimum association dues were $25 and the maximum 15 cents on each 100 tons output, and that not more than six cents per 100 tons had yet been assessed in any one year. The executive committee outlined the following service to be given to members for dues paid:

1. Exchange and sale of used machinery.
2. General service at request of members.
3. Help solve national highway problems of importance.
4. Boosting fine stone screenings where sand is now used.
5. Wage scale information in different parts of country.
6. Cost production information for members.
7. Help solve abuse of open-top cars in exclusive use for coal.
8. Urge superiority of crushed stone for ballast over other materials.
9. Fluxing stone market information —Michigan 36 cents per ton; Illinois, $1.85.
10. Traffic information to help solve freight rate and transportation problems.
11. Market information on application. Same to be compiled in general office regularly.
12. Seek and urge for the stone industry the recognition to which it is justly entitled among engineers, architects, contractors and commercial and civic bodies.

New Machinery and Equipment

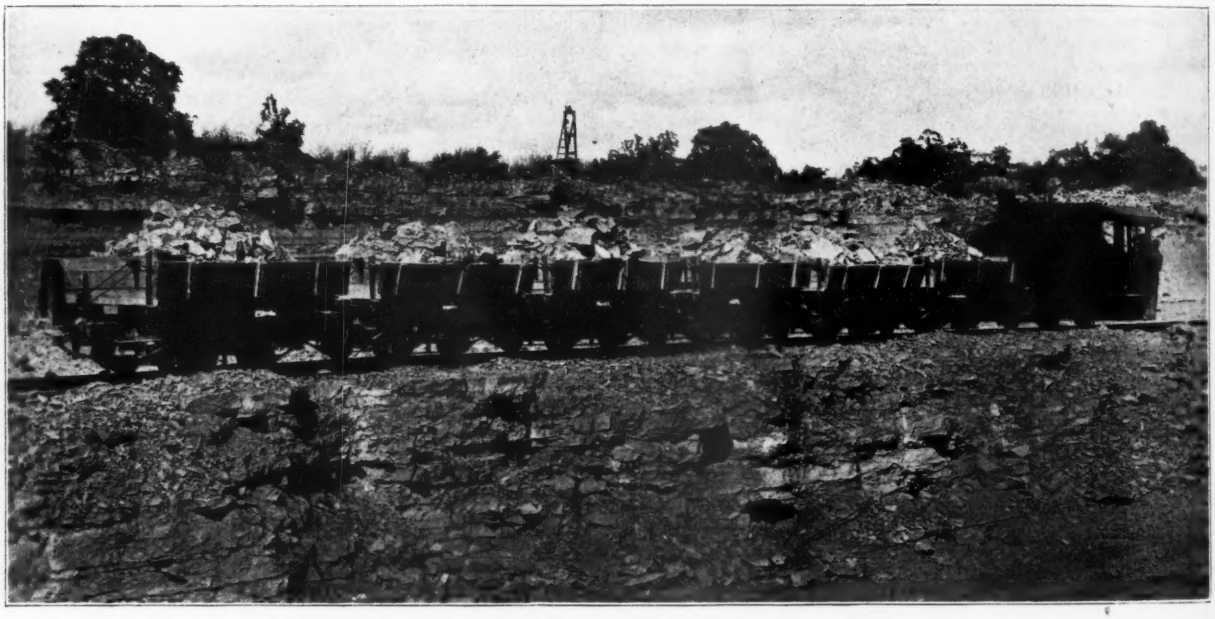
One-Way Dump Car From Rebuilt Contractor Type Car

A SCHEME for converting the well-known contractor or construction type, two-way dump car into a one-way dump car, strengthening it and thus making it more adaptable for quarry use, has been devised by G. L. Hancock, Geneva, N. Y., a quarry superintendent of many years' **experience.**

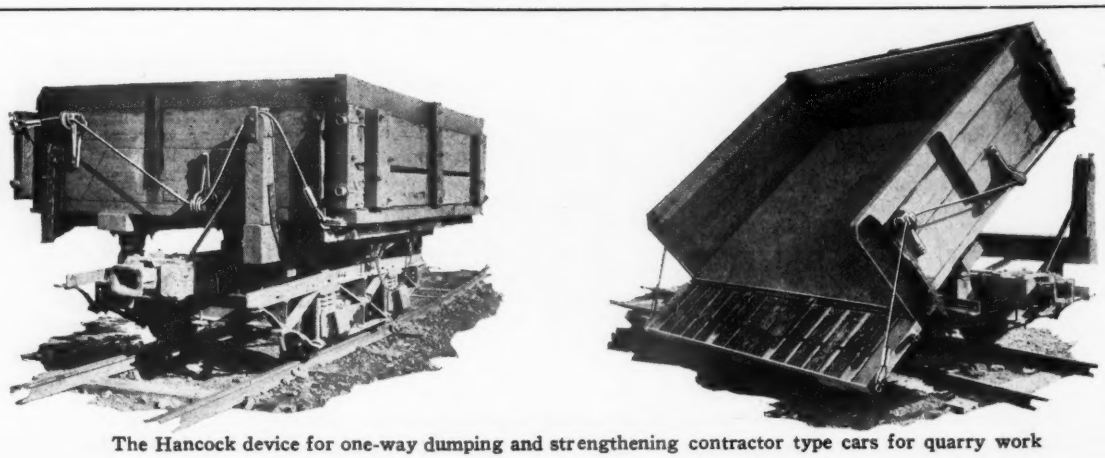
The essentials of the device are shown in the accompanying views. The inventor claims the following advantages for the arrangement:

"The work of rebuilding this car was done at slack times by the plant repairman and the blacksmith, at a cost no greater than to rebuild the car to its original type. It can be dumped by a ram, air hoist or any sort of friction drum belted to a convenient shaft. Because of the load resting squarely on the truck frame and the end thrusts or jolts taken care of by the bolster, which is firmly braced to the frame, an additional ton is added to its capacity. This additional ton per car is an important factor in cost and production. There is easy access to draft-rigging, also reinforced lower corner of door frame. There are no chains to hook or loosen; one man attends the dump. This car is provided with a drop door which opens as the body is tilted and closes as the body returns to loading position; no door interference or door troubles. If the cable looks small, remember that the safe load of a one-half inch cable is not less than one and one-half tons. Control of dumping often saves bridging over the crusher and helps to avoid the high peak power loads. Maintenance cost is surprisingly low."

Cars with this device are in use by the Le Roy Lime and Crushed Stone Corp., Le Roy, N. Y.; the Buffalo Crushed Stone Co., Buffalo, N. Y.; and, the Geneva Stone Corp., Geneva, N. Y.



New York state quarry using converted contractor type dump cars



The Hancock device for one-way dumping and strengthening contractor type cars for quarry work

Compact Car Puller

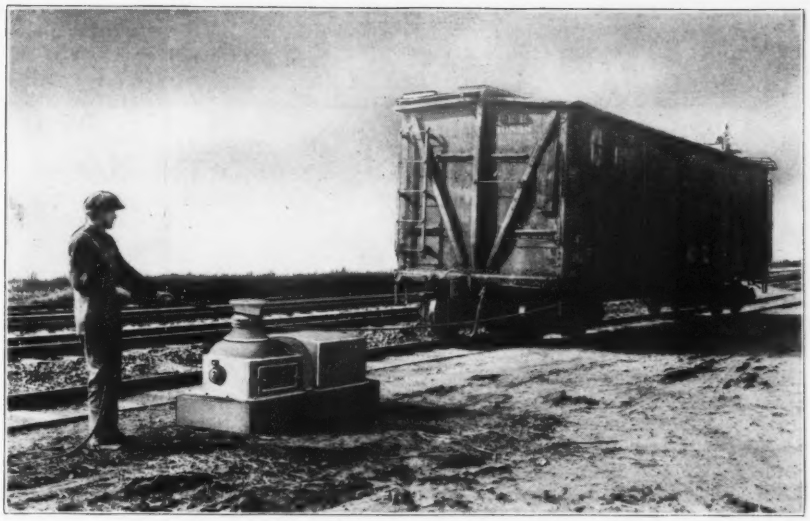
THE MINING MACHINE CO., Mountville, Pa., has recently placed on the market a vertical capstan for car spotting that should find a wide field of usefulness in the rock products industry. This car puller is made to be driven either by a direct-connected (through reducing gears) electric motor or by belt.

The motor-driven puller is shown in the accompanying view. It is completely housed and is weather-proof.

The advantage claimed for this type of car puller is that a pull can be made from any angle.

The motor-driven car puller is provided with a steel sub-base. The complete equipment is installed and properly anchored on a concrete foundation. The bevel gears are enclosed in the bowl of the car puller. The bearings are babbitt, lubricated with grease by means of compression cups. All parts enclosed are easily accessible for inspection by removing the face plate.

The car puller of the belted type is provided with a crown face pulley of proper size to give the required speed of the capstan. No sub-base is necessary as the flange extension at the bottom of the bowl gives ample support for installing this type of car puller.



New compact electric-motor-driven car puller

"LeClair" Scraper Added to Sauerman Bros.' Line

ANNOUNCEMENT is made by Sauerman Bros., 1140 Monadnock Block, Chicago, that they have arranged with S. D. LeClair of San Francisco, Calif., to take over the manufacturing and selling rights on the power drag scraper of which Mr. LeClair is patentee.

The "LeClair" scraper that is commonly used in excavating sand and gravel and re-handling loose materials is V-shaped, a feature that distinguishes it from the three scrapers of Sauerman design, the "Crescent," "Excavator," and "Type C."

The "LeClair" scraper

Crawling Tread Crane

A CRAWLING TREAD LOCOMOTIVE CRANE modeled after its heavier and larger capacity standard gage rail types is being offered by Orton & Steinbrenner Co., 608 South Dearborn Street, Chicago. It is furnished in two sizes, 7 tons, with 30-ft. boom, and 12 tons, with 35-ft. boom, and besides the crawling tread it can be arranged to operate on broad faced road wheels or on standard or special gage railroad tracks. Extra lengths of boom may be supplied.

The crawling tread is said to be developed from and to be an improved form of that used on the tanks during the European War. The tread links and sprockets are of cast steel and the chain idler rollers are bronze bushed with a patented pressure system of lubrication. Each crawling tread is supported on bottom between the drive sprocket and idler by four pairs of idler rollers. Each pair of idler rollers is carried in an equalizing strut backed by a heavy coil spring and when traveling over obstacles such as railroad tracks, the rollers, it is said, will tilt as much as 6 in. from the horizontal. This device is further said to equalize the pressure of the crane on the ground, enabling it to travel over the roughest surfaces while yet maintaining constant compression on the springs. It is claimed that the crane will travel up grades of 20 to 30 per cent in soft material.

Crawling tread locomotive crane

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.00	1.50	1.50	1.50	.....
Buffalo, N. Y.	1.30 per net ton, all sizes					
Burlington, Vt.	1.00	.....	2.50	2.00	2.00	.....
Chaumont, N. Y.	1.75	1.75	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Eastern New York	.90	1.80	1.70	1.60	1.60	1.50
Eastern Penna.	1.00	.....	1.85	1.85	1.85	1.85
Munns, N. Y.	1.00	Other sizes 1.50				
Walford, Pa.	1.25	1.75	1.75	1.75	1.75	1.75
Western New York	.70	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45	.....	.....
Alton, Ill.	2.00	.....	1.50	1.50	.....	.....
Bettendorf, Ia.	All sizes, 2.00 cu. yd. f.o.b. quarry					
Buffalo, Ia.	1.00	1.35	1.45	1.25	1.35	1.35
Chicago, Ill.	1.40	1.60	1.40	1.40	1.40	1.40
Columbia, Ill.	2.15	1.90	2.00	2.00	1.90	1.90
Davenport, Ia.	1.50•	1.50•	1.50•	1.50•	.....	.....
Dundas, Ont.	1.00	1.50	1.50	1.50	1.25	1.20
Eden and Knowles, Wis.	1.30	1.30	1.30	1.30	1.30	.....
Greencastle, Ind.	1.75	1.35	1.25	1.20	1.20	1.20
Illinois, Southern	2.00	1.75	1.75	1.75	1.50	.....
Kokomo, Ind.	1.10	1.25	1.25	1.10	1.10	1.10
Krause or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	1.30
Lannon, Wis.	1.00	1.10	1.10	1.10	1.10	1.10
Marblehead and Brillion, Wis.	1.10	.....	1.20	1.10	1.10	.....
Montrose, Ia.	1.35	1.75	1.75@1.85	1.75	1.65@1.75	.....
Oshkosh, Wis.	1.40 per ton, all sizes					
River Rouge, Mich.	1.50	1.65	1.65	1.50	1.50	1.50
St. Louis, Mo.	.60	1.60	.....	.....	.....	.....
Sheboygan, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Stolle, Ill. (I. C. R. R.)	2.25	.....	1.75	1.75	1.75	1.75
Stone City, Ia.	.60	.....	1.55	1.35	1.45	.....
Toronto, Canada	1.90	2.40	2.40	2.40	2.15	2.10@2.15
SOUTHERN:	These prices include 90c freight					
Cartersville, Ga.	.....	1.85	1.60	1.60	1.60	.....
Chico, Texas	.....	1.00	1.50	1.50	1.25	1.10@1.25
Columbia, S. C.	1.00@1.25	3.50	3.50	3.50	.....	.....
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Fort Springs, W. Va.	1.40	1.60	1.75	1.75	1.45	.....
Ladds, Ga.	1.75	1.75	1.75	2.00	2.00	.....
New Braunfels, Tex.	.60	1.50	1.50	1.25	1.25	1.25
WESTERN:						
Atchison, Kans.	.50	1.10	1.10	1.10	1.10	1.10
Blue Springs and Wymore, Neb.	.20	1.65	1.65	1.60@1.65	1.45@1.50	1.40
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	2.00	.....	.....	.....	.....

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	1.25	2.50	2.35	2.25	2.00@2.25	2.00
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	.....
Branford, Conn.	.80	1.95	1.80	1.60	1.40	.....
Bound Brook, N. J.	2.00	2.30	2.00	1.75	1.75	.....
Dresser Jct., Wis.	1.00	2.45	2.45	2.30	2.00	.....
Duluth, Minn.	.75@1.00	2.25	1.90@2.00	1.40@1.50	1.40@1.50	1.50
Dwight Station, Calif.	.75@1.00—all sizes					
E. Summit, N. J.	2.10	2.35	2.15	1.75	1.75	.....
Eastern Mass.	.60	1.95	1.75	1.50	1.50	1.50
Eastern Penna.	1.60	2.25	1.95	1.80	1.80	1.75
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60@1.00	1.60@1.80	1.60@1.80	1.40@1.50	1.20@1.30	.....
Oakland, Calif.	1.10	1.10	1.10	1.10	1.10	1.10
Richmond, Calif.	.50•	.....	1.75•	1.50•	1.50•	.....
San Diego, Calif.	.50@.70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	2.15	2.35	2.15	2.00	1.85	1.75
Westfield, Mass.	.60	1.35	1.30	1.20	1.20	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Ableman, Wis.	1.60	.....	1.30	1.50	1.20	.....
Alexandria Bay, N. Y.	1.60	.....	1.30	1.50	1.20	.....
Baltimore, Md.—Gneiss	1.00	2.75	2.40	2.20	2.10	1.75
Berlin, Wis.	1.60	.....	1.40	1.50	1.30	.....
Columbia, S. C.—Granite	.75	.....	2.75	2.50	2.35	.....
Dell Rapids, S. D.	1.00	.....	2.10	2.10	2.10	.....
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
Eastern Penna.—Sandstone	1.20	2.00	2.00	1.70	1.70	1.70
Eastern Penna.—Quartzite	.90	1.70	1.55	1.20	1.20	1.10
Holton, Ga.—Granite	.40	.....	2.50	2.25	2.25	2.00
Lohrville, Wis.	1.60	.....	1.30	1.50	1.20	.....
Los Angeles, Cal.—Granite	.....	1.25@1.50	1.15@1.40	1.15@1.40	.....	.....
Macon, Ga.—Granite	.50	.....	2.50	2.25	2.00	2.00
Middlebrook, Mo.—Granite	4.00	.....	2.00	2.00	.....	1.50‡
Sioux Falls, S. D.	1.00	.....	2.00	2.10	2.00	.....
Red Granite, Wis.	1.60	.....	1.30	1.50	1.20	.....
Stockbridge, Ga.—Granite	.50	2 00	1.90	1.75	1.75	.....
Utley, Wis.	1.60	.....	1.30	1.50	1.20	.....

•Cubic yard. †Agrl. lime. ‖R. R ballast. §Flux ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.50; bulk 2.75

Grove City, Pa. — Analysis, 94.75% $CaCO_3$, 1.20% $MgCO_3$ — 70% thru 100 mesh; 80 lb. ppr., 5.50; bulk 4.50

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; sacks, 4.50; bulk 2.75

New Castle, Pa.—85% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 4 mesh; sacks, 5.00; bulk 3.25

Syracuse, N. Y. — Analysis, 90% carbonates—50% thru 100 mesh, 90% thru 50 mesh; sacks, 3.50; bulk 2.75

Texas, Md.—Analysis, 58.02% $CaCO_3$, 37.3% $MgCO_3$—50% thru 50 mesh; bags, 4.25; bulk 2.50

Walford, Pa. — 50% thru 100 mesh, 60% thru 50 mesh, 100% thru 10 mesh; sacks, 5.00; bulk 3.25

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$ — 90% thru 100 mesh; paper bags, 6.25—90% thru 50 mesh; paper bags, 5.25; bulk 3.25

West Stockbridge, Mass.—Analysis, 95% combined carbonates; 33% thru 200 mesh, 66% thru 100 mesh, 100% thru 20 mesh; sacks 5.25@5.50; bulk 3.25

Williamsport, Pa. — Analysis, 88-90% $CaCO_3$, 3-4% $MgCO_3$—50% thru 50 mesh; paper, 5.50; bulk 4.00

CENTRAL:

Alden, Ia.—Analysis, 99.16% $CaCO_3$ ..... .80

Alton, Ill. — Analysis, 96% $CaCO_3$, 0.3% $MgCO_3$—50% thru 4 mesh 4.50

Pulverized limestone 2.00

Bedford, Ind. — Analysis, equivalent 98.5% $CaCO_3$—90% thru 100 mesh .. 1.60@2.00

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Cape Girardeau, Mo.—Analysis, 90% $CaCO_3$, .044% $MgCO_3$—50% thru 4 mesh 1.50

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh 1.50

Columbia, Ill., near East St. Louis—½-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh ..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh 1.25

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh 2.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh 2.00

Marblehead, O.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$—52.4% thru 100 mesh, 59% thru 50 mesh, 100% thru 10 mesh; sacks, 5.25; bulk 3.00

McCook, Ill.—Analysis, 54.10% $CaCO_3$, 45.04% $MgCO_3$—100% thru ¼-in. sieve, 78.12% thru No. 10, 53.29% thru No. 20, 38.14% thru No. 30, 34.86% thru No. 50, 22% thru 100 ..... 1.50

Milltown, Ind.—Analysis, 91.59% $CaCO_3$, 4.87% $MgCO_3$ — 24% thru 200 mesh, 33.6% thru 100 mesh, 40% thru 50 mesh, 50% thru 40 mesh, 70% thru 20 mesh 1.65

Mitchell, Ind.—50% thru 100 mesh 2.00

Montrose, Ia.—90% thru 100 mesh 1.25

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.50@1.75

Piqua, O. — Analysis, 82.8% $CaCO_3$, 8.2% $MgCO_3$; neutralizing power in terms of calcium carbonate, 95.3%—50% thru 100 mesh ..... 3.50@5.50

50% thru 50 mesh ..... 1.75@2.00

Ridgeville, Ind.—Analysis, 98% $CaCO_3$ 100% thru 4 mesh 1.75

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk ..... .80@1.40

Stolle, Ill., near East St. Louis on I. C. R. R. — Thru ½-in. mesh — Analysis, 89.61% to 89.91% $CaCO_3$, 3.82% $MgCO_3$ 2.25

Stone City, Ia.—Analysis, 98% $CaCO_3$ —90% thru 50 mesh ..... .60

Toledo, O.—Analysis, 52.72% $CaCO_3$, 43% $MgCO_3$—20% thru 100 mesh, 30% thru 50 mesh, 80% thru 100 mesh, 100% thru 5/32 screen 1.80

Whitehill, Ill. — Analysis, 97.12% $CaCO_3$, 2.50% $MgCO_3$ — 90% thru 100 mesh 5.00

50% thru 50 mesh 2.00

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

Yellow Springs, O.—Analysis, 96.08% $CaCO_3$, .63% $MgCO_3$—32% thru 100 mesh, 58% thru 50 mesh, 99% thru 10 mesh; sacks, 8.25 ..... 5.25

SOUTHERN:

Blowers, Fla.—Analysis, 98% combined carbonates—75% thru 200 mesh 5.00

Cartersville, Ga.—Analysis, 96% combined carbonates — pulverized limestone ..... 1.75@2.00

Claremont, Va. (Marlime) — Analysis, 90% $CaCO_3$, 2% $MgCO_3$—90% thru 50 mesh; bulk 3.50

Dittlinger, Tex. — Analysis, 99.09% $CaCO_3$, .04% $MgCO_3$—90% thru 100 mesh ..... 2.00@3.00

90% thru 4 mesh ..... 1.00@2.00

Grovania, Ga.—Analysis, 95% $CaCO_3$, no $MgCO_3$—50% thru 100 mesh 2.50

Hopkinsville, Ky. — Analysis, 94.6 to 98.1% $CaCO_3$; bulk 2.00

Knoxville, Tenn.—Pulverized 2.50

90% thru 100 mesh 2.00

90% thru 50 mesh 1.50

Ladds, Ga.—Pulverized limestone 2.50

Linnville Falls, N. C.—Analysis,, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; sacks, 4.50; bulk 3.00

Memphis, Jct., Ky—Analysis, 95.31% $CaCO_3$, 1.12% $MgCO_3$; average price. ⅛ in. down 2.00

Mascot, Tenn.—Analysis 52% $CaCO_3$, 38% $MgCO_3$.

80% thru 100 mesh 3.00

All thru 10 mesh 2.50

80% thru 200 mesh 5.00

Paper bags, $1.50 extra per ton; burlap, $2.00 extra per ton.

Maxwell, Va. 2.50

Mountville, Va. — Analysis, 76.6% $CaCO_3$, 22.83% $MgCO_3$—100% thru 20 mesh; 100 lb. ppr., 7.00; bulk 5.00

Ocala, Fla. — Analysis, 98% $CaCO_3$—75% thru 200 mesh 4.50

WESTERN:

Colton, Calif.—Analysis, 95% $CaCO_3$, 1½% $MgCO_3$—all to pass 14 mesh; bags 5.00; bulk 3.50

Sacks, 15c extra, returnable.

Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh ..... .50

Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk 2.00

Terminus, Calif. — Analysis, 96.2% $CaCO_3$, .04% $MgCO_3$—60% thru 200 mesh, 90% thru 100 mesh, 95% thru 50 mesh, 100% thru 4 mesh; sacks, 6.00; bulk 5.25

Tulsa, Okla.—90% thru 4 mesh ..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Beach City, O.—Washed and screened 3.00

Berkeley Springs, W. Va. ..... 2.50@3.50

Cedarville and South Vineland, N. J. ..... 2.25@2.75

Cheshire, Mass. ..... 5.00@7.00

Columbus, Ohio ..... **2.50@3.00**

Gray Summit, Mo. ..... **2.50@4.00**

Hancock, Md.—Damp ..... 2.50@3.50

Klondike and Pacific, Mo. ..... **2.50@3.00**

Mapleton, Pa.—Dry 3.50

Glass, damp 2.50

Massillon, Ohio **3.50**

Millington, Ill. 1.75

Mineral Ridge, Ohio 3.50

Montoursville, Pa.—Green, washed ..... **2.00@2.75**

Morgantown, W. Va. ..... **3.00@3.25**

Oregon, Ill.—Large contracts 1.75

Ottawa, Ill. ..... 2.00@2.25

Pittsburgh, Pa.—Dry, 4.00; damp **3.00**

Rockwood, Mich. ..... 3.25@3.50

St. Marys, Pa.—Green 2.75

Thavers, Pa.—Washed ..... 2.00@2.50

Utica, Ill. ..... 1.85@2.25

FOUNDRY SAND:

Ableman, Wis. — **Brass molding and molding fine** **3.00**

Albany, N. Y.—Glass and sand blast ..... 2.00@7.00

Core ..... 1.40@2.50

Furnace lining ..... 2.50@3.00

Molding fine, coarse and brass ..... 2.00@3.50

Allentown, Pa.—Core ..... 1.50@1.75

Molding coarse ..... 1.50@1.75

Arenzville, Ill.—Molding fine ..... 1.50@1.75

Beach City, O. — Core, washed and screened ..... 2.00@2.50

Furnace lining ..... 2.50@3.00

Molding fine and coarse ..... 2.25@2.50

Bowmantown, Pa.—Core ..... 1.35@1.50

Molding, coarse ..... 1.80@2.00

Cleveland, O.—Molding coarse ..... 1.50@2.00

Brass molding ..... 1.50@2.00

Molding fine ..... 1.50@2.25

Core ..... 1.25@1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	**.75**	**.75**	**.75**	**1.00**	**1.00**	**1.00**
Erie, Pa.	.....	1.00	.....	1.65	.....	1.75
Farmingdale, N. J.	.48	.48	.....	.....	1.50	.....
Hartford, Conn.	**.90**	.....	1.25	1.15	1.15	1.15
Leeds Junction, Me.	.....	.60@ .75	2.00	1.75	1.65	1.50
Ludlow, Mass.	**.75•**	**.75•**	**1.70**	.....	**1.50•**	**1.50•**
Philadelphia, Pa.	.75	.75	.....	1.65	1.50	.....
Pittsburgh, Pa.	.....	1.30	1.30	1.30	.85	.85
Portland, Maine	.....	.50@ .60	.....	1.50	.....	1.35
Texas, Md.	.....	1.00	.....	Pure white sand,		1.50
Washington, D. C.	.75	**.75**	2.00	**1.40**	**1.20**	**1.20**
CENTRAL:						
Alton, Ill.	.....	.85	.....	.....	.....	.....
Anson, Wis.	.50	.50	.....	1.00	.....	.90@1.00
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.	.60	.60	.70	.70	.70	.70
Beloit, Wis.	.....	.60	.60	.....	.60	.....
Chicago, Ill.	.....	1.75@2.23	1.75@2.43	.....	.....	.....
Cincinnati, O., and vicinity	.65	.60	.85	.85	.85	.85
Columbus, O.	.90	.90@1.25	1.25	.90@1.25	.90@1.25	.90@1.25
Des Moines, Ia.	.90	.65	1.60	1.60	1.60	1.60
		25% gravel, .90; 50% gravel, 1.15				
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.50	.50	1.00@1.25	1.00	1.00	.....
Elgin, Ill.	.....	.80	1.00	.80	.80	.80
Elkhart Lake, Wis.	.70	.58	.90	.90	.72	.72
Grand Rapids, Mich.	.....	.60	.....	.90	.85	.85
Greenville, Mechanicsburg, O.	.80	.70	.80	1.00	.85	.80
Hamilton, O.	.....	.90	.....	.....	.90	.....
Hawarden, Ia.	.....	.70	.....	.....	1.60	.....
Indianapolis, Ind.	.60	.60	.....	1.50	.75@1.00	.75@1.00
Janesville, Wis.	.....	.65@ .75	.....	.....	.65@ .75	.....
Le Mars, and Doon, Ia.	.....	**.90**	.....	**1.80**	.....	.....
Libertyville, Ill.	.....	.75	.....	.75	.75	.....
Lincoln, Neb.	Sand	**.80, sand and gravel**	**1.30, drained for shipment**			
Mason City, Ia.	.90	.80	1.90	1.80	1.70	1.65
Milwaukee, Wis.	1.30	1.30	1.40	1.40	1.40	1.40
Minneapolis, Minn.	.50	.50	1.50	1.50	1.50	1.50
Moline, Ill.	1.00	1.00	1.30	1.30	1.30	1.30
Oxford, Mich.	.....	.60	.....	.85	.85	.85
St. Louis, Mo., f. o. b. cars	1.60	1.65	1.80	1.60	1.60	1.55
Summit Grove, Clinton, Ind.	.....	.90	.90	.90	1.00	1.00
Terre Haute, Ind.	1.00@1.25	1.00	1.25	1.25	.90@1.25	.90@1.25
Winnipeg, Man.	1.90	1.90	.....	3.25	.....	2.85
Winona, Minn.	.70	.60	2.00	1.75	1.50	1.25
Yorkville, Moronts, Oregon and Sheridan, Ill.	**.90**	**.90**	**.90**	**.90**	**.90**	**.85**
SOUTHERN:						
Alexandria, La.	.60@ .90	.....	.....	.....	.....	1.65@1.85
Charleston, W. Va.	.....		Sand 1.40—Gravel 1.50			
Ft. Worth, Tex.	2.00@2.25•	2.00@2.25•	2.75@3.00•	2.75@3.00•	2.75@3.00•	.....
Greenville, Miss.	.....	1.10	.....	.....	.....	1.00
Jedburg, Mo.	.....	1.05	1.20	1.00	1.00	.95
Knoxville, Tenn.	1.15	1.15	.....	2.15	1.95	1.75
Lake Weir, Fla.	.....	**.75**	.....	.....	.....	.....
Macon, Ga.	.....	.75@1.00	.....	.....	.....	.....
Memphis, Tenn.	**1.40**	**1.40**	**1.50**	.....	.....	**1.50**
N. Martinsville, W. Va.	.....	1.30	.....	.....	.....	1.00
New Orleans, La.	1.00	.....	1.75	.....	1.25	.....
Pine Bluff, Ark.	1.25	.92	Washed gravel, all sizes, 2.30			
Roseland, La.	.....	.....	.....	1.25	.....	.....
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.		(Kaw River sand, car lots, .75 per ton, Missouri River, .85)				
Niles, Calif.	1.00	1.00	1.40	1.00	1.00	1.00
Pueblo, Colo.	1.10•	1.00•	.....	.....	1.50•	.....
San Francisco, Calif.	.....	1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.50•	1.50•	2.00•	1.50•	.....	1.50•

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel 2 inch and less
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.75	.75	.75	.75	.75	.75
Boonville, N. Y.	.60@ .80	.....	.55@ .75	.....	.....	1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Ia.			.80 per ton—1.20 washed			
Detroit, Mich.	1.10•	.....	.....	.....	.....	.....
Dudley, Ky. (Crushed Sand)	.....	1.05	.....	1.00	.....	.....
Elkhart Lake, Wis.			Washed gravel .66			
Fishers, N. Y.	.65@ .85	.75@ .85	.....	.....	.....	.65@ .85
Ft. Jefferson, Mechanicsb'g, O.	**.70**	**.60**	**.60**	.....	.....	.....
Glenville, N. Y.	.....	.....	.....	1.00•	.....	.....
Hamilton, O.			6 in. and less, .60 per ton			
Hartford, Conn.	.....	**1.00•**	.....	.....	.....	.....
Hersey, Mich.	.....	.60	.60	.60	.....	.....
Janesville, Wis.	.....	.65	.....	.....	.65@ .75	.....
Lindsay, Tex.	.85	.....	.....	.....	.60	.60
Oxford, Mich.	.....	.....	.....	.65	.65	.65
Pine Bluff, Ark.			Road gravel .60			
Roseland, La.	.....	.75	.....	.....	.....	.....
Saginaw, Mich., f. o. b. cars	.....	.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand 1.70			
Summit Grove, Ind.	**.65**	**.65**	**.65**	**.65**	**.65**	**.6‖**
Valde Rouge, La.	.....	.....	.....	.....	.....	**.85**
Waco, Texas	.....	**.80**	.....	**1.50**	.....	**1.30**
Yardville, N. J.	.....	**.50@ .75**	.....	.....	.....	.....
York, Pa.	.....	1.10@1.20		(crushed rock sand)		

•Cubic yard. B Bank. L Lake. ‖ Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.10	2.50	1.35	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Erie, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.50	.75	1.50	1.20	1.20	1.20	1.20
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ironton, O.	2.40	other grades 1.75@2.00					
Jackson, O.	2.00	1.35	1.70	1.35	1.35	1.35	1.35
Stuebenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	2.20	1.70	1.95	1.95	1.95	1.70	1.70
Youngstown, Dover, Hubbard, Leetonia, Struthers, Steubenville, Lowellville & Canton, O.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
SOUTHERN:							
Alabama City, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Ensley, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95

Agricultural Lime and Hydrate

	—Agricultural Lime— Bulk	Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.		8.00	58	0.5	
Bellefonte, Pa.	8.50	11.50	98.2	.72	12.00
Berkeley, R. I.			**50**	**18**	**15.00**
Branchton, Pa.		5.50			
Cassadaga, N. Y.—Marl		10.00	48.07	1.08	
Chippewa, Pa.	6.00		78.67	1.33	
Hot Springs, N. C.	3.00	4.50			
Lime Kiln, Md.	8.00				10.75
Lime Ridge, Pa.	6.00@7.50		80.56-62.71	3.87-1.96	
Paxtang and Lemoyne, Pa.	5.50		63	3	
Rockland, Maine		8.00	65	1	
Rosendale, N. Y.	7.00		84	7	6.00
Union Bridge, Md.	11.00	5.50	73	1	13.00
Williamsport, Pa.	6.00	10.00	75	3	10.00
West Rutland, Vt.	4.50	7.50	68	3	
West Stockbridge, Mass.					15.00
Williams and Blue Bell, Pa.		8.25	57	33	11.25
York, Pa.	8.50		95	3	12.00
CENTRAL:					
Alton and Hannibal, Ill.	11.50		.95		
Delaware, O.			50.0	5-12	10.00
East Sparta, O.			42	62	10.00
Knowles and Valders, Wis.	5.00	9.00	55	45	12.50
Marblehead, O.			85.10	12.92	12.00
Mitchell, Ind.					12.50
Sheboygan, Wis.	5.50	8.50	58	40.5	
Woodville, Ohio			49.16	32.43	11.50
SOUTHERN:					
Burns, Tenn.	9.50		96	0.54	12.00
Claremont, Va. (Marl.)	5.00	7.00	85-95	2-5	
Erin, Tenn.	7.50@10.00		97.82	0.12	
Karo, Va.	9.00		97	1.25	
Knoxville, Tenn.	9.00		98.23		13.00
Staunton, Va.	8.00	10.50	85	10	
WESTERN:					
Colton, Calif.			**97**	**2**	**15.00**
Kirtland, N. Mex.	12.00				
San Francisco, Calif.			98-99	.5-.75	19.50
Tehachapi, Cal.	12.00@15.00	14.00@17.00	**98**	**1.00**	

Miscellaneous Sands

(Continued from preceding page)

Columbus, O.—Core	.60@2.50
Brass molding	2.50
Sand blast	5.00@5.50
Glass sand	3.00
Molding, fine and coarse	2.00@2.25
Conneaut, O.—Molding fine	2.25@2.50
Molding coarse	2.00@2.25
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass Molding	2.15
Dresden, O.—Core	1.50
Molding fine and coarse	1.50@1.75
Brass molding	2.50
Dunbar, Pa.—Glass sand No. 2, damp	3.00
Traction, damp	3.25
Dundee and Chalfants, O.—Core	3.00
Glass, sand blast and traction	3.00
Molding fine, brass molding	3.75
Molding coarse	3.25
Furnace lining	2.75
Eau Claire, Wis.—Core	.75@1.25
Sand blast	3.00@4.25
Traction sand	.50
Falls Creek, Pa.—Glass sand, washed	2.50
Core sand, washed or unwashed	2.00
Furnace lining, unwashed	2.00
Molding fine, washed	2.50
Molding coarse, washed or unwashed	2.00
Sand blast, washed	3.50
Stone sawing, washed	2.50
Traction, washed	2.00
Fleetwood, Pa.—Furnace lining	**2.25**
Franklin, Pa. and Utica, Pa.—Traction	2.50
Brass molding	2.25
Core	1.50@2.50
Molding fine	2.25
Molding coarse	2.50
Sand blast	5.00
Greenville, Ill.—Molding coarse	1.60@1.80
Howard, O.—Glass sand	3.00@3.25
Steel molding	2.25@2.50
Joplin, Mo.—Stone sawing and roofing	1.25
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and stone sawing	1.75
Klondike and Gray Summit, Mo.—Molding fine	2.00@2.50
Molding coarse	2.50@3.00
Mapleton, Pa.—Core, furnace lining, molding coarse and brass molding	2.00
Molding fine	2.25
Roofing sand	2.00@3.00
Sand blast	1.50@2.00
Massillon, O.—Glass sand, molding fine and coarse, core, traction and furnace lining	3.00
Michigan City, Ind.—Core, glass, traction and brass molding	.60
Millington, Ill. — Glass, core, furnace lining, roofing and stone sawing	1.75
Mineral Ridge, O. — Core, molding, sand blast, roofing, etc., washed, screened (damp)	2.75
Montoursville, Pa.—Core and traction	1.50@2.00
Brass molding	1.75@2.25
New Lexington, O.—Molding fine	2.25
Molding coarse	2.00
Oregon, Ill.—Core and glass sand	2.00
Furnace lining	2.00
Molding fine and coarse	1.00
Sand blast	3.50
Stone sawing	2.00

Miscellaneous Sands

(Continued)

Ottawa, Ill.—Crude silica sand	1.00@1.25
Core, molding, fine and coarse	1.10@2.25
Furnace lining	1.25@2.00
Roofing and traction	2.00
Sand blast and stone sawing	4.00@5.00
Ottawa, Minn.—Core	2.00@2.50
Glass, molding coarse, roofing, stone sawing (all crude silica)	2.00@2.50
Ridgeway, Pa.—Glass sand, green	2.25
Glass sand, wash	2.50
Molding, fine and coarse	1.20
Rockwood, Mich.—Core	3.00
Roofing, stone sawing	3.50
Sand blast	4.00
Round Top, Md. — Glass sand, core and roofing sand; washed, damp	1.75@2.25
San Francisco, Cal.—Glass and roofing	3.00@3.50
Core, molding fine and brass	2.30@2.60
Furnace lining and molding coarse	3.60@4.25
Coarse core sand	3.60@4.25
Sand blast	2.30@3.60
Stone sawing and traction	2.30
Thayer, Pa.—Traction	1.75@2.00
Furnace lining	1.10
Molding fine and coarse	1.25
Core, green	1.75@2.00
Tulsa, Okla.—Sand blast	6.50
Utica, Ill.—Core and furnace lining	1.25@1.50
Molding, fine and coarse	1.00@1.35
Stone sawing and roofing	1.25@2.25
Sand blast	3.50
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry)	2.50
Same, green	2.25
Wedron, Ill.—Core (crude silica)	1.00
Molding fine	1.00
Furnace lining	1.25
West Albany, N. Y.—Molding fine	2.25
Molding coarse	2.25
Winnipeg, Man., Can.—Roofing sand	4.00
Zanesville, Ohio—Molding fine and brass	2.00@2.25
Molding coarse	1.75@2.00
Furnace lining	2.75
Steel molding	2.50
Pulverized silica thru 140 mesh	8.50
Thru 200 mesh	9.50

Crushed Gypsum

Akron, N. Y.	3.50
Blue Rapids, Kan.	3.50
Castalia, O.	3.50
Ft. Dodge, Ia.	3.50@4.50
Grand Rapids, Mich.	3.50@4.50
Gypsumville, Man., Can.	3.50
Oakfield, N. Y.	**4.00**
Gypsum, O.	3.50
Port Clinton, O.	4.50
Rapid City, S. Dak.	5.00
Saltville, Va.	**4.50**
Winnipeg, Man., Can.	5.00

(Gypsum) Land Plaster

Castalia, O.	6.00
Bags extra—Jute 3.00; ppr., 1.00.	
Garhutt, N. Y.—Bags extra	7.50
Grand Rapids, Mich.	7.50
Mound House, Nev.	7.40@8.00
Sacks, .25 extra.	
Oakfield, N. Y.	7.50
Los Angeles, Calif.	12.50

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 68%	6.00@7.00
B.P.L. 70%	7.50@8.00
B.P.L. 72%	8.50@9.00
Mt. Pleasant, Tenn.—B.P.L. 75%	8.00@9.00
Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	4.50
Wales, Tenn.—B.P.L. 70%	8.00

Ground Rock

Per 2000-lb. Ton

Centerville, Tenn.—B.P.L. 70%—90% thru 100 mesh	9.00@10.00
B.P.L. 75% (brown rock)	12.00
Mt. Pleasant, Tenn — B.P.L. 68%—13% Phosphorus	7.50@9.00
14% Phosphorus	8.00
B.P.L. 65@70%	7.00@9.00
Norwills, Fla.—(Fla. Hard Rock)—B.P.L. 68%	10.00

Natural Cement

Current price for 500 bbl. or over, f.o.b., exclusive of bags:

Minneapolis (Rosendale)	$2.80
Kansas City (Ft. Scott)	1.60
New Orleans	3.36
Atlanta (Magnolia)—ton	11.00
Boston (Rosendale)	2.35
Cincinnati (Louisville)	2.75

Florida Soft Phosphate

Raw Land Pebble

Per Ton

Bartow and Norwills, Fla.—B.P.L. 52%, bulk	6.00
B.P.L. 78%, bulk	13.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

Per Ton

Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—24% phos. acid	17.50@20.00
Lakeland, Fla.—B.P.L. 72%	13.50
B.P.L. 60%	6.00

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags:

New York (del.)	$2.80
New York, alongside dock, to dealers	2.40
Jersey City (del.)	2.64
Boston	2.87
Chicago	2.17
Pittsburgh	2.17
Cleveland	2.43
Detroit	2.43
Indianapolis	2.43
Toledo	2.49
Milwaukee	2.39
Duluth	2.10
Peoria	2.45
Cedar Rapids	2.51
Davenport	2.47
St. Louis	2.60
San Francisco	3.09
New Orleans	3.36
Minneapolis	2.41
Denver	3.10
Seattle	3.10
Dallas	2.85
Atlanta	3.00
Cincinnati	2.87
Los Angeles	3.21
Baltimore (del.) drayload lots	3.58
Montreal	3.44
Winnipeg	3.36

NOTE—Bag charge is generally 10c each.

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Easton, Pa.—Green Marble, loose in cars	14.00	12.00
Lincoln, Neb.—Red, white, grey, in bags		30.00
Missouri river points—Different colors	20.00@25.00	20.00@25.00
Piqua, O.—Marble	8.00@10.00	8.00@10.00
Tuckahoe, N. Y.—White Marble	12.00	12.00
Crushed white stone and marble dust in 100 lb. bags	8.50@12.00	
Tate, Ga.—White limestone, sacks extra	6.00@ 7.00	6.00@ 7.00
Wisconsin and S. Dak. points—Granite, different colors, bulk or sacks	1.50@ 2.00	3.00@ 7.00
Granite dust in bags	6.00	

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	13.00@14.00
Barton, Wis.	14.00
Boston, Mass.	18.00@19.00
Brighton, N. Y.	19.50
Buffalo, N. Y.	**16.50**
El Paso, Texas	14.00
Gary, Ind.	11.50@12.00
Grand Rapids, Mich.	15.00
Lancaster, N. Y.	16.50
Michigan City, Ind.	12.00
Milwaukee, Wis. (delivered at job)	17.50
Minneapolis, Minn.	13.00
Portage, Wis.—Common	15.00@25.00
Face	35.00
Saginaw, Mich.	14.75
San Antonio, Texas—Common	18.00
Face	25.00
South Dayton, Ohio	16.50
Syracuse, N. Y. (delivered at job)	20.00
F. o. b. cars, plant	16.00
Toronto, Can.	17.00
Washington, D. C.	14.50
Winnipeg, Can. (less $1 trade disc.)	19.00

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$8.10
24x14	9.30	8.40	8.10	8.10
22x12	10.72	8.70	8.77	9.10
22x11	10.72	8.70	8.77	9.10
20x12	10.72	8.70	8.77	9.10
20x10	11.70	9.60	9.42	9.42
18x10	11.70	9.60	9.42	9.42
18x 9	11.70	9.60	9.42	9.42
16x10	11.70	9.60	9.42	9.42
16x 9	11.70	9.60	9.42	9.42
16x 8	11.70	9.60	9.42	9.42
18x12	11.05	9.30	9.10	9.10
16x12	11.05	9.30	9.10	9.10
14x10	11.05	9.30	8.77	8.77
14x 8	11.05	9.30	8.77	8.77
14x7 to 12x6	10.40	9.00	8.45	.....
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.50	$5.75
22x11	9.10	7.75	7.75	5.75
Other sizes	9.10	8.10	8.45	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

The following are the prices per square for slate, f.o.b. cars quarries, Granville, N. Y., the prices given in each case being for No. 1 Sea Green Roofing Slate:

22x11, 20x12, 20x11, 20x10, 18x12, 18x10, 18x9, 16x12, 16x10	10.20
24x12, 22x12, 16x9, 16x8, 14x12, 14x10	9.90
26x14, 24x14, 22x14, 20x14	9.60
14x9, 14x8, 12x10	9.00
14x7, 12x9, 12x8	8.70
12x7, 11x8, 11x7, 10x8	7.50
12x6, 10x7	7.20

Granulated slate per net ton, f. o. b. quarries, Vermont and New York, 7.50.

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finished	Hydrate per Ton Common
New York	$21.00	$20.00
Chicago	20.00	.....
St. Louis	26.00	20.00
Boston	29.00	26.00
Dallas	.....	25.00
Cincinnati	17.60	16.60
San Francisco	25.40	22.00
Minneapolis	29.00 (white)	22.00
Denver (bbl.)	32.00	.....
Detroit	**22.00**	**19.00**
Seattle	24.00	.....
Los Angeles	30.00	30.00
Baltimore	22.25	17.50
Montreal	30.00	.....
Atlanta	.....	18.00
New Orleans	.....	22.50
Winnipeg	.....	21.20

	Lump per 200-lb. Barrel Finished	Lump per 200-lb. Barrel Common
New York	$ 3.50 at plant	$ 3.30*
Chicago	.....	1.65
St. Louis	.....	4.12½*
Boston	3.80	3.55
Dallas	.....	2.50†
Cincinnati	.....	13.10‡
San Francisco	.....	2.25
Minneapolis	2.00	1.70
Denver	1.00 (bu.)	3.20
Detroit	2.00†	1.80†
Seattle	3.25	2.75
Los Angeles	3.00*	3.00*
Baltimore	.....	12.75‡
Montreal	15.00‡	.....
Atlanta	.....	1.60
New Orleans	.....	2.40
Winnipeg	3.20	13.80‡

*300-lb. barrels. †Per 180-lb. barrel. ‡Per ton.
NOTE—Refund of 10c per barrel.

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude talc	4.00
Cubes	50.00
Blanks, per lb.	.08
Chatsworth, Ga.—Crude talc	8.00@10.00
Ground talc (150-200 mesh), bags	12.50
Pencils and steel workers' crayons, per gross	1.50@ 2.00
Chester, Vt.—Ground talc (150-200 mesh), bulk, 10.50@12.00; bags	12.00@14.00
Emeryville, N. Y.—Crude Talc	4.00
Glendale, Calif.—Ground talc (150-200-mesh (Bags extra)	16.00@30.00
Gouverneur, N. Y.—Crude talc	4.00
Ground talc (150-300 mesh)	17.00@24.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	3.00@ 3.25
Ground talc (20-50 mesh), bags	8.50@ 9.00
Ground talc (150-200 mesh), bags	11.00@13.50
Johnson, Vt.—Ground talc (20-50 mesh), bulk (Bags extra)	8.50
Ground talc (150-200 mesh), bulk (Bags extra)	10.00@20.00
Keeler, Calif.—Ground talc (200-300 mesh), bags (Bags extra)	18.75@32.00
Los Angeles, Calif.—Ground talc (20-50 mesh) 200-lb. bags	12.00
Ground talc (150-200 mesh) 200-lb. bags	20.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@18.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk (Bags extra)	8.50@10.00
Ground talc (150-200 mesh), bulk (Bags extra)	10.00@22.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk (Bags extra)	8.50
Ground talc (150-200 mesh), bulk, 10@15.00 and (Bags extra)	10.00@15.00
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Concrete Brick

Prices given per 1,000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Bellow Falls, Vt.	20.00	35.00
Bridgeport, Conn.	31.00	32.00
Buffalo, Niagara Falls and Rochester, N. Y.	21.00	.....
Eau Claire, Wis.	20.00	30.00@40.00
Houston, Tex.	.....	22.00
Lockport, N. Y.	17.00	.....
Milwaukee, Wis.	17.00@18.00	35.00@65.00
Omaha, Neb.	32.00	42.00
Piqua, O.	18.00	25.00
Portland, Ore.	25.00	43.00@73.00
Fancy brick	100.00@150.00	
St. Paul, Minn.	18.00	32.00
Springfield, Ill.	18.00	20.00@25.00
Tonawanda, N. Y.	20.00	.....

Variations in Talc Prices May Mean Variations in Quality

TALC DEPOSITS in this country vary considerably in quality, making it almost impossible to establish a standard. For example, some parts of Vermont produce a dark, greenish talc, quite slippery, while some of that produced in New York is a snow-white, fibrous, chalky material. The Southern and Western states produce still another quality. Due to these variations in quality the consumer of talc such as the paper and paint manufacturers or roofing concerns must first pick the quality desired, then consider the price.

News of the Industry

Incorporations

The Papago Mining Co., Wilmington, Del., has been incorporated for $500,000.

The Allwood Lime Co., Manitowoc, Wis., has increased its capital stock to $50,000. Valentine H. Surghnow is president of the company.

The Milford Sand & Gravel Co., Milford, Ia., has been incorporated for $200,000, by L. L. Bingham, of Estherville and F. D. Pearce of Mason City.

The Cumberland Sand Co., Massillon, O., has been incorporated for $5,000 by A. Schott, P. A. Kuhn, F. O. Humberger, A. T. Underhill and C. H. Albright.

The Davis Construction Co., Medford, Mass., has been incorporated for $50,000 by Franklin M. Davis, 27 Harold St., president and treasurer and L. H. Chase.

St. Maurice Lime Co., Ltd., Three Rivers, Que., has been incorporated with a capital of $750,000 to acquire stone quarries and to deal in building supplies of all kinds.

The Milwaukee Lumber Co., Milwaukee, Wis., has been incorporated for $40,000 by S. Walczak, Andrew Nowak, and Casimir W. Filut to deal in all kinds of building materials.

The L. L. Sherman Construction Co., Janesville, Wis., has been incorporated for $2,500 by Lee L., Alice and Hilda Sherman. The company will deal in building and concrete machinery.

Robert D. Green, Inc., 3332 Frederick Avenue, Baltimore, Md., has been incorporated to engage in the building material business, by Robert and Clement S. Green and Wm. H. Hudgins.

The Fall River Cement Construction Co., Fall River, Mass., has been incorporated for $25,000 by Henry Savoie, president; A. N. Moreau, 98 Park St., treasurer and W. E. Crowther.

The Minerals Reduction Corporation of America, Berwick, Me., has been incorporated for $10,000,000 by Thomas I. Hogan, president; Ralph W. Goss, treasurer and E. F. Gowell, clerk.

Neihart, Montana, Development Co., Portland, Me., has been incorporated for $500,000 by R. E. Coyle, president and H. P. Sweetser, treasurer and clerk. The company will engage in general mining work.

The Spindler Co., Manitowoc, Wis., has increased its capitalization to $150,000. The company deals in building materials of all kinds. E. C. Spindler is president and J. P. Staehle is secretary.

Mount Eagle Feldspar Co., Ltd., Toronto, Ont., has been incorporated with a capital of $1,000,000 by F. J. Langer, T. E. Wanstall, C. K. McConnaughey, J. O. Brown, and M. B. R. Gordon, all of Cleveland, Ohio.

The Lockstone Silo & Construction Co., Sioux Falls, S. D., has been incorporated for $100,000, by H. A. Taft, 3025 Fremont Avenue, S., Minneapolis, Minn., and Dr. Donald E. Smith, 1917 Katherine Street, Sioux City, Ia.

Frank Doherty Co., Milwaukee, Wis., has increased its capital from $25,000 to $100,000. The company does a general contracting business. Frank Doherty is president and A. J. Stock is secretary of the company.

The Twin City Cement Co., St. Paul, Minn., has been incorporated for $25,000 by Henry Henly, president; M. C. Welsh, vice-president; Wm. O'Malley, secretary and Frank P. O'Malley, treasurer, all of St. Paul. The company will deal in cement.

The Lake Shore Stone Products Co., Sandusky, O., has been incorporated for $500,000. The new company has bought all the equipment of the Butler Stone Co. and will install it at the old Lake Shore Quarry located between Sandusky and Castalia.

The Cayuga Island Corporation, Inc., Niagara Falls, N. Y., has been incorporated for $150,000 by John J. O'Haire, C. Gregory Martin and Roy M. Van Wagen all of Niagara Falls. The company will develop sand and gravel deposits on Cayuga Island.

The Garden City Sand Co., Chicago, Ill., has been licensed to use $1,342 of its $100,000 capital in Wisconsin for leasing and operating sand and gravel pits. C. B. Shelfer is president of the company and Frank Kirkhoff, New Munster, Wis., is representing the company in Wisconsin.

The Corona Machine Corp., Malden, Mass., has been incorporated for $25,000 by M. L. Insogna, president; C. Lowell Hanson, 270 W. Emerson St., Melrose, Mass., treasurer, and Justin A. Duncan. The company will manufacture and deal in crushing, grinding and mixing machinery.

The White Silica Sand Co., Ottawa, Minn., has been incorporated for $25,000 by Edward Gugisberg, president-treasurer; F. C. Frost, vice-president, and Eva Gugisberg, secretary. The company will quarry and deal in sand, gravel and stone. They will also manufacture concrete products.

The Silver Hill Sand & Cement Products Co., Silverhill, Md., has been incorporated for $25,000, with the following officers: John Campbell, president; Robert H. Alcorn, vice-president; W. W. Keeler, secretary; Frank Bell, manager. They will erect their own buildings and will manufacture structural tile, caps, sills, steps, etc.

Sand and Gravel

J. C. Stephenson, Nashville, Ark., is heading a company which will open a gravel plant near Nashville

The Henderson Sand & Gravel Co., of Henderson, Ky., has increased its capital stock from $25,000 to $60,000.

The Keystone Sand and Gravel Co., Port Townsend, Wash., is making repairs on its plant on Whidby Island near Ft. Casey and will soon begin shipping sand and gravel.

William Cochran, Guion, Ark., is rebuilding his sand plant which was destroyed by fire several months ago. The plant furnishes sand to glass factories in Oklahoma, Louisiana and Texas.

The Three Forks Portland Cement Co., Trident, Mont., has recently completed its sand and gravel plant and is ready to operate the same. The company's cement plant is closed for an indefinite period.

The Reliance Sand and Gravel Co., Des Moines, Iowa, has amended its articles of incorporation increasing its capitalization to $80,000. M. H. Cohen is president and J. S. Goodrell is secretary of the company.

The Southern Illinois Sand and Gravel Co., Paducah, Ky., is making extensive improvements on its plant preparatory to starting operations. The company proposes to produce its own electric power for operating the plant. W. F. Barnard, Pittsburgh, Pa., is promoting the proposition.

The Atwood David Sand Co., Chicago, Ill., has increased its capitalization from $40,000 to $100,000. The company's sand plant is located at Rockford, Ill. W. P. Whitcomb, Rochelle, Ill., is president and A. S. Sorenson, Chicago, Ill., is secretary of the company.

Lime

The O. J. Keller Lime Co., Frederick, Md., has retained Richard K. Meade and Co. as engineers to design and superintend the construction of a modern hydrated lime plant. The new plant will be of steel and concrete construction and will be equipped with the most approved system for the manufacture of hydrated lime. In addition to the hydrated lime plant there will be a large storage for hydrated lime in bags.

Quarries

The Steadley and Co., Carthage, Mo., suffered a fire loss estimated at about $100,000 recently in its quarry plant.

The Sandstone Quarry Co., Sandstone, Minn., of which James Tyre is local superintendent, has suffered a fire loss amounting to $50,000.

The John E. Baker Stone Co., Mount Wolf, Pa., operating local quarries, has arranged for a wage reduction of from 30 to 25 cents an hour. About 50 men are now employed at the plant.

Mr. Mongler, Centralia, Mo., is preparing to install a $10,000 rock crushing plant with a capacity of 100 tons daily. He proposes to manufacture both agricultural limestone and crushed stone for road work.

The Stowe Trap Rock Co., Philadelphia, Pa., has been organized to operate a stone quarry, as well as sand and limestone properties. The company is headed by Joseph P. Murray, Frank S. Muzzey, and James P. Fogarty, Finance Building.

The Wenz Co., Inc., Shelly, Pa., has extensive development work under way at a local granite quarry. Considerable equipment will be installed at the properties and large production arranged. An analysis of the granite shows a crushing strength greater than 23,530 pounds per sq. in. The company maintains a stone-working and distributing plant at Twentieth and Hamilton Streets, Allentown, Pa.

Gypsum Products

Gypsum deposits south of the Dunaway mine near Westmorland, Calif., may be developed. H. C. Culver of New York City is head of the syndicate investigating the properties.

The Imperial Gypsum and Oil Co., of California has started their Dunaway mine near Westmorland, Calif. They also have a large force of men at work getting the site cleared preparatory to the erection of a new mill at the mine.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

Of Rock Products, published every other week at 542 S. Dearborn St., Chicago, Illinois, for April 1, 1921.

State of Illinois, County of Cook.

Before me, a Notary Public in and tor the State and county aforesaid, personally appeared Geo. P. Miller, who, having been duly sworn according to law, deposes and says that he is the manager of the Rock Products and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation, etc.), of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publishers, editor, managing editor, and business managers are: Publishers, Tradepress Publishing Corporation, Editor, Nathan C. Rockwood, Managing editor, Nathan C. Rockwood, Business manager, Geo. P. Miller, all at 542 S. Dearborn St., Chicago, Ill.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.) Tradepress Publishing Corporation, W. D. Callender, Geo. P. Miller, T. J. Sullivan, N. C. Rockwood, C. O. Nelson, H. H. McQuilken, W. B. Mayor, D. R. Hicks, H. P. Sessions, Forest O. Poor, all at 542 S. Dearborn St., Chicago, Ill., and C. H. Fuller, New York City..

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) There are none.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustees is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities, in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is .....

(This information is required from daily publications only.)

(Signed) GEO. P. MILLER,
Business Manager.

Sworn to and subscribed before me this 25th day of March, 1921.

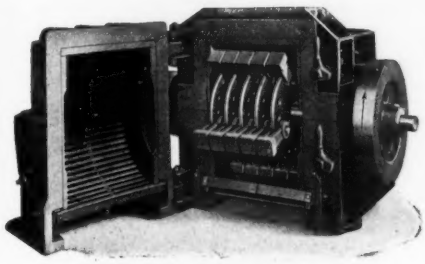
MABEL OLSEN, Notary Public.

(My commission expires April 12, 1922.)

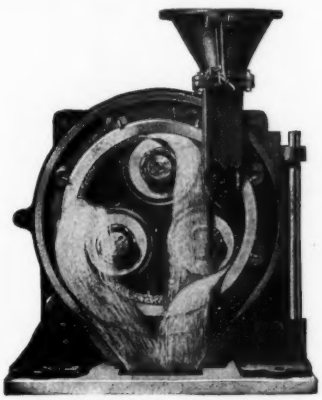
Form 3526.—Ed. 1916.

"ONE MAN – ONE MINUTE"

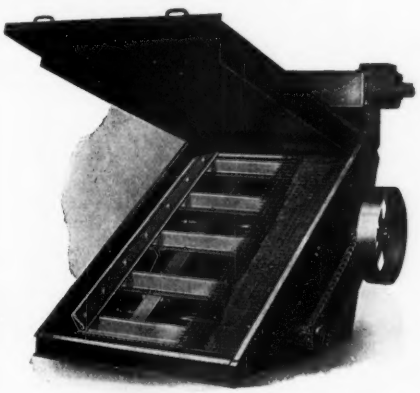
STURTEVANT "OPEN-DOOR" MACHINERY



"Open-Door" Swing-Sledge Mill



"Open-Door" Ring-Roll Pulverizer



"Open-Door" "Bucking-Broncho" Screen

Sturtevant Mill Co.

manufactures the largest line of machinery adapted to the reduction of

Limestone and Lime

It makes machines for both large and small outputs.

Agricultural Limestone

Complete units, with all necessary elevators, screens, chutes, bins, etc., taking the limestone in large pieces and reducing it to any degree of fineness up to 80 mesh. Any part of above supplied separately.

JAW CRUSHERS

for preliminary crushing

"Open-Door" Swing Sledge Mills for reducing 3-in. limestone to any degree of fineness up to 20 mesh.

"Open-Door" Ring-Roll Pulverizers for making fine, evenly graded agricultural limestone in large quantities, to any fineness from 10 mesh to 80 mesh.

Burnt Lime

Crushers and Pulverizers for reducing burnt lime from large sizes to a finish without screens—Crushers for reducing cores.

Hydrated Lime

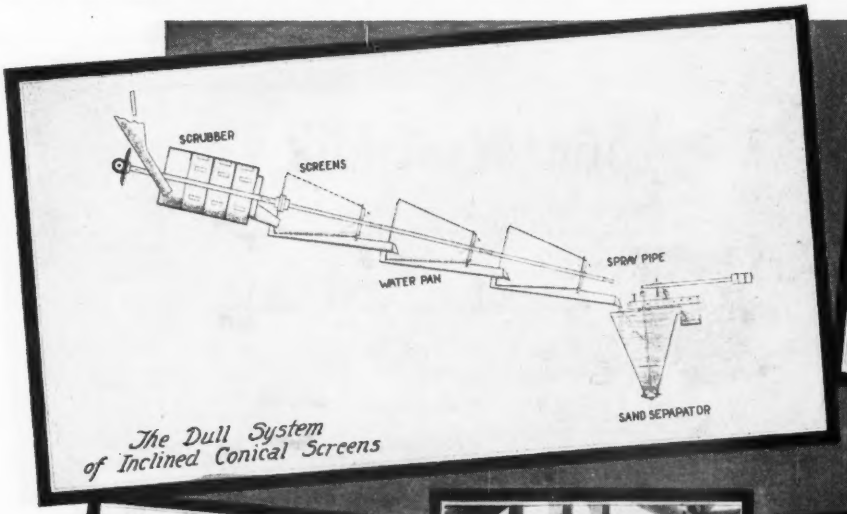
Crushers, Pulverizers and Air Separators for hydrating processes.

Screens, elevators, conveyors, chutes, bins, spouts, etc.

STURTEVANT MILL CO., BOSTON MASS.

BOSTON, HARRISON SQ. NEW YORK, SINGER BLDG. CHICAGO, PEOPLES GAS BLDG. ATLANTA, HEALEY BLDG.

LINK-BELT
Sand and Gravel Plants



The Dull System of Inclined Conical Screens

Inclined Conical Screens

Conical Sand Separator

Preliminary Scrubber

Steel Water Pan

ONE of the reasons for the success of Link-Belt Plants lies in the patented Dull system of inclined conical screens, illustrated. Their principle of operation is the reverse of that used in ordinary screening processes.

The gravel, sand and water are fed into the first screen together, and pass directly through the large holes into a water-pan underneath, with the exception of the largest sizes of stones, which are screened out and discharged through the small end of the cone into the first bin. The water-pan delivers into the next screen where the process is repeated for the next operation, and so on through the desired number of separations. The material is fed into the large end of the screen which has the most wearing surface. This method provides the largest screening area where most of the material is screened and heaviest plates where the coarsest material is handled.

Each series of screens is mounted on a single long shaft, supported by bearings between the screens. The drive is simple—a pair of bevel or angle gears, applied at one end of the shaft. The value of these features can be measured in greater efficiency, less power required, and lower maintenance expense.

Link-Belt Plants are designed and built to meet the individual requirements. Send for book No. 440.

LINK-BELT COMPANY

PHILADELPHIA 726 — CHICAGO — INDIANAPOLIS

Offices in principal cities

Worthington Apparatus insures economy

THE ties that bind the cement industry to Worthington are many—and efficient.

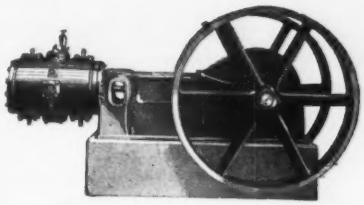
For from great 50″ Superior McCully Gyratories to the small steam pumps, Worthington machinery is spotted at strategic points from quarry to power plant.

Read the roll of Worthington-built mining and power plant equipment: Gyratory and jaw crushers, rolls, converters, mills, conveying apparatus, from the Worthington Power and Mining Works, at Cudahy, Wisc.

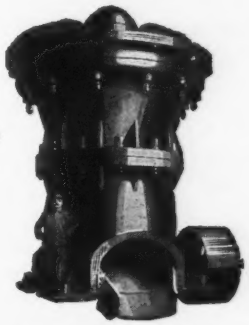
Gas and heavy oil engines, condensers, compressors; steam, centrifugal and power pumps; meters, feed water heaters, etc., from eight other Worthington works.

Worthington power plant equipment has established enviable records of economic efficiency both in large central station and isolated plant installations. Each apparatus group is made up of standard and special types. Each type design is based on fact-founded data gathered through over two generations of engineering and manufacturing.

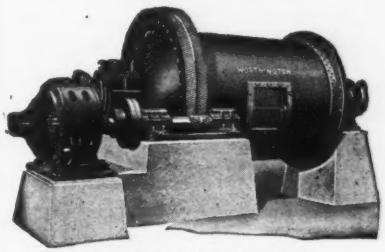
WORTHINGTON PUMP AND MACHINERY CORPORATION
***Executive Offices:* 115 Broadway, New York City**
Branch Offices in 24 Large Cities



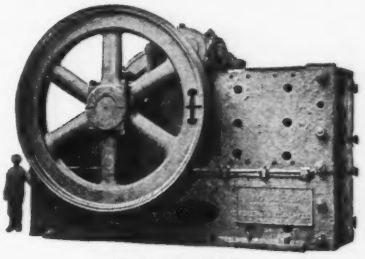
Single Power-Driven Air Compressor



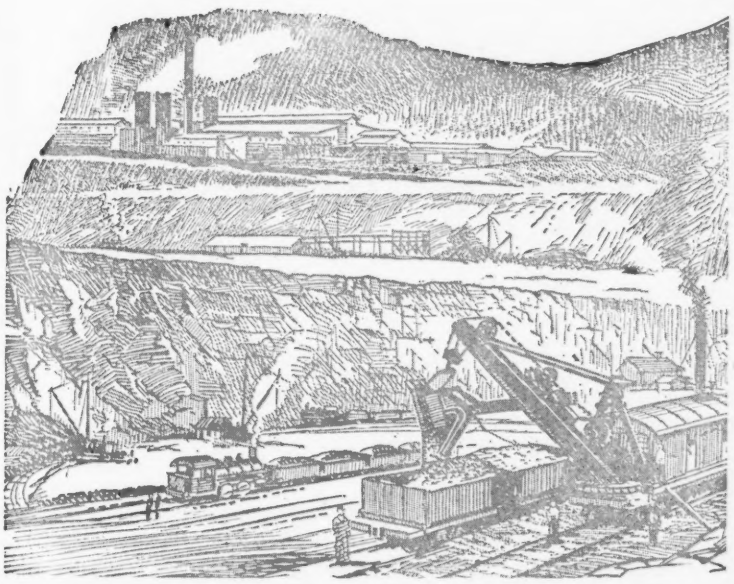
Superior McCully Gyratory Crusher



7′ x 10′ Tube Mill—Direct Motor Driven



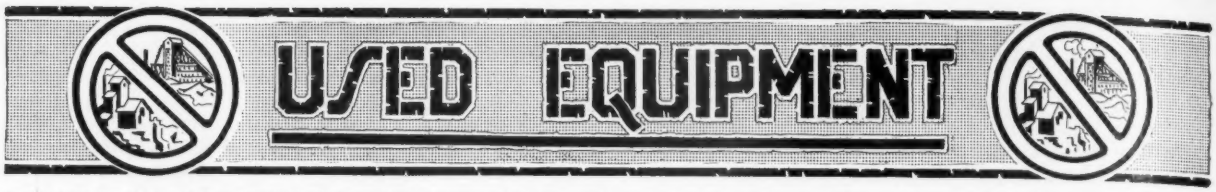
Superior Jaw Crusher



UMPS—COMPRESSORS—CONDENSERS—OIL & GAS ENGINES—METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY

WORTHINGTON

Deane Works, *Holyoke, Mass.*
Blake & Knowles Works *East Cambridge, Mass.*
Worthington Works *Harrison, N. J.*
Laidlaw Works, *Cincinnati, Ohio.*
Hazleton Works, *Hazleton, Pa.*
Gas Engine Works, *Cudahy, Wis.*
Power & Mining Works *Cudahy, Wis.*
Snow-Holly Works *Buffalo, N. Y.*
Epping-Carpenter, *Pittsburgh, Pa.*



Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. please send check with your order. These ads must be paid in advance of insertion.

Repaired Contractors' Equipment

Steam Shovels

Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 2059, 2130

1—Model 1 Thew, on railroad trucks, ⅞-yard dipper.

1—Bucyrus Model 70-C, Shop No. 1219.

2—Model 28 Marion Revolving, ⅝-yard dippers.
1—Model O Thew Revolving, ½-yard dippers.
1—Type "B" Erie Revolving, ¾-yard dippers.

We have a large stock of thoroughly repaired Construction Equipment of all kinds ready for immediate shipment.

Locomotives

8—18-ton, 10x16" Porter Dinkeys, 36" gauge.
2—12-ton, 9x14" Porter Dinkeys, 36" gauge.
1—17x24", 55-ton, 4-6-0, standard gauge.
3—25-ton Forney type.

Clam Shell Buckets

1—1¼-yard Williams Hercules Bucket.

Cars

30—Western Air Dump 12-yard, standard gauge.
40—Western 4-yard, 36" gauge, steel beam.

H. KLEINHANS COMPANY

Union Arcade **Pittsburgh, Pa.**

AUSTIN GYRATORY CRUSHERS

2—No. 2, Standard Drive
1—No. 3, Standard Drive
1—No. 5, Standard Drive
1—No. 5, Angle Drive
1—No. 6, Standard Drive
1—No. 7½, Standard Drive

These are a few specials that we wish to move quickly. We also have Crushers of other makes and sizes, also Jaw Crushers, Elevators, Screens, Conveyors, Cranes, Locomotives, Cars, Rail, Hoists and other machinery such as you use. Write us fully, and if you have excess plant, also mention what it is.

Reading Engineering Co., Inc.
1227 Tribune Bldg. New York, N. Y.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50' 6x50' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 3½x25', 5x60' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 2½x3" 3x3½' pebble and ball mills; 8x4', 6x4' and 4x4' continuous ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; **4½x20', 5x11', 5x20', 5½x22' and** 6x20' tube mills; 7½x13", 9x15", 16x10" and 30x60" jaw crushers; one "Infant" No. 00, No 0, No. 2, No. 3, and No. 9 Williams' swing hammer **mills; one Kent type "G" mill; 36" and** 40" cage mills; 3' and 4½' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one **No. 2 Sturtevant ring roll crusher; 3 roll and** No. 000, No. 00 and No. 0 Raymond mills; one No. 5 Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8', 6x5' and 4x3' Newaygo vibrating screens, Richard**son automatic scales.**

Air compressors and tanks.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

Crushing and Grinding Machinery

1—No. 8 Gates Gyratory Crusher.
6—Blake Type Jaw Crushers.
6—Sets Cornish Crushing Rolls.
1—Set 36"x14" High Speed Rolls.
1—42" Fuller Mill.
1—No. 3 Williams Crusher and Pulverizer.
2—No. 4 Williams Universal Mills.
1—Portable Crushing Plant.
12—Steam Hoists.
20—Steam Pumps.
12—Steam Engines.
8—Large Blowers.
25—Rock Drills—Air.
Elevators and Screw Conveyors.

The Machinery & Supply Corporation
Joplin, Missouri

USED EQUIPMENT

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Locomotives for Rent or Sale

2—50-ton 18x24 in. six-wheel switchers.
1—40-ton 17x24 in. four-wheel switcher.
1—40-ton Vulcan four-driver saddle-tank.
2—18-ton and 14-ton 36-in. gauge Vulcans.
2—10-ton 7x12 in. 36-in. gauge Vulcans.
1—10-ton 36-in. gauge Shay geared.

Miscellaneous

1—Marion 35 steam shovel on traction wheels.
1—Marion 76 steam shovel, No. 3503.
1—Lidgerwood dragline, 60-ft. boom, 2-yd. bucket.
100—60,000-lb. capacity box cars, 40-ft. long.
40—60,000-lb. capacity flat cars, 36-ft. long.
15—6-yd. dump cars, 4-ft. 8½-in. gauge.
12—1½-yd. "V" steel dump cars, 36-in. gauge.
1—Western standard gauge spreader.
2-in., 4-in., and 6-in. simple, duplex, and centrifugal pumps, 10 H.P. and 45 H.P. upright boilers, tripod drills, etc.

LOCOMOTIVE CRANES, RAILWAY EQUIPMENT, etc.

INDUSTRIAL EQUIPMENT CO.
McCormick Building, Chicago, Ill.

Immediate Delivery

6, 7½, 9 & 18 K CRUSHERS

No. 4 GYRATORY CRUSHING PLANT, N. Y.
2—18-in. and 24-in. Disc Crushers.
3—150-hp. 125-lb. Marine type boilers.
2—150-hp. 125-lb. H. R. T. boilers, buttstrap.
4 No. 6 Gates (Mang. Fit.) nickel steel shafts.
50 and 75-hp. single drum hoists.
No. 2, 3 and 4 Gates, reg. drive.
Air compressors (steam-belt), 50 to 4000 ft.
40 boilers, 60-150-hp., 100-130 lbs.
5, 6 and 12 ton 24-in. gauge gasoline loco's.
1—8x8 and 10x10 Air Comp. (belt).
2—180-ft. Quick Shift, 30-ft. buck-t towers.
6-in., 8-in. and 10-in. SAND PUMPS.
25—40-hp. Thomas D. D. Elec. Hoist A. C.
5, 10 and 15-ton HOLT TRACTORS, PRAC. NEW.
NEW 3000 ft. 2 stage Air Comp. and Motor.
Send us your inquiries—Sand Pumps, Motors, Contractors' Equip., etc.

ROSS POWER EQUIP. CO.
Indianapolis, Ind.

LOCOMOTIVES

One—68-ton, standard gauge, Baldwin Mogul; 180-lb. pressure.
One—56-ton, standard gauge, American 10-wheeler; 175-lb. pressure.
Two—50-ton, standard gauge, Brooks 6-wheel switchers; 160-lb. pressure.
One—65-ton, standard gauge, Shay Geared Locomotive.
One—24-ton, standard gauge, Shay Geared Locomotive.
One—14-ton, 36" gauge, American Saddle Tank.
Two—23-ton, brand new, 36" gauge, Porter 6-wheel switchers; separate tenders.
One—Model 14-B Bucyrus Shovel.

The above are only a few items of our stock. Will gladly send you our complete stock lists.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

WANTED

One small second-hand Tube Mill. Give full particulars, whether lined or unlined.

Box 1484 **Care of Rock Products**

FOR SALE

One piece new Goodyear Conveyor Belt, 47 ft. long, 40 in. wide, 6 ply, $5.00 per lin. ft., with ⅛-in. Rubber Cover on carrying side. This belt is being sold at this price on account of being the wrong size for our use.

DOOLEY BROTHERS
Peoria, Illinois

FOR SALE

One—Westinghouse 780 KVA (625 KW) Turbine Outfit.

One—Westinghouse-Leblanc Condenser.

One—16 KW Exciter Outfit.

All in first class condition. For full particulars address

Phoenix Portland Cement Co.
Nazareth, Pa.

WISH TO BUY

New or Second Hand 25 H. P. Double Drum steam or gasoline Hoist, with Boom swinger.

Kost Brothers, Downer, Minn.

FOR SALE

2—5'6"x20' Schmidt Tube Mills complete.

For full particulars address

Phoenix Portland Cement Company,
Nazareth, Pa.

SPECIAL BARGAINS

Boilers—Firebox, 40 HP.
Economic Type, 20, 30, 40, 60, 80, 100 HP.
Tubular, 40, 50, 70, 80, 100, 150, 175 HP.
Water Tube, 135, 200, 230, 275 HP.
Engines—Corliss, Automatic, Throttling—all sizes.
Pumps—Steam, Centrifugal and Motor Drive.
Woodworking machinery of all kinds.
Iron Working — Lathes, Shapers, Drills, Planers, etc.
Generators and motors.
Hoisting Engines with and without boilers.

THE CLEVELAND BELTING & MACHINERY CO.
1510 University Road, Cleveland, Ohio

"Everything for the Quarry"

¾-yd. Thew "O" Traction Shovel.
3-ton Plymouth 4' 8½" ga. Gasoline Locomotive.
7x12 cyl. 36-in. gauge Davenport Saddle Tank.
9x14 cyl. 36-in. gauge Vulcan Saddle Tank.
10x16 cyl. 36-in. gauge Porter Saddle Tank.
10—24-in. gauge 1½-yd. Western Dump Cars.
15—36-in. gauge 4-yd. Western Dump Cars.
3—16-yd. Western Air Dump Cars.
33-in. R. H. Lehigh Fuller Mills.
7x10 and 8x10 DC, DD Hoisting Engines.
Rails, Boilers, Derricks, Steam Shovels.

ZELNICKER IN ST. LOUIS
Before You Buy Get Big Bulletin 290.

New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

FOR SALE

2 RAYMOND 8-ft. tubular dust collectors complete with 18-ft. cloth tubes. **One Brand New. One Used.**

Rockland & Rockport Lime Corp., Rockland, Maine

WANTED

Second hand grinding mills, Griffin type preferred; also a good crusher. Address

Box 1475 **Care of Rock Products**

"Dredging Pump" For Sale

One No. 10-D Erie Pump & Engine Works Standard Dredging Pump, with suction elbow, pulley, and suction bonnet. 10" connections. Used about three months. In good condition and a bargain.

ROYAL C. WISE
(Pumps for Dredging or Water Supply)
1642, 53 W. Jackson Blvd., Chicago

CLASSIFIED ADVERTISING

New and Used Machinery

FOR SALE

1—36" American Pulverizer.
1—1 yard (new) Riesler clam shell bucket.

Acme Brick Co., Milwaukee, Wis.

Plant for Sale

ROCK CRUSHING PLANT

Normal capacity 1000 tons 9 hours, practically new and modern in every respect; operating to capacity. Must be sold owing to personal differences in company; can be handled with a small amount of cash and will stand the closest investigation. Location Southwest. Orders enough on hand to run unlimited time.

Box No. 1482 Care of Rock Products

Situation Wanted

POSITION WANTED

By practical Cement Mill Superintendent, 16 years' experience wet and dry plants. Can furnish A-No. 1 references and am employed at present but desire a change of location. Address

Box 1483 Care of Rock Products

When in the market for machinery or equipment, look through the advertisements of ROCK PRODUCTS. If you do not find what you want advertised in this issue, write us and we will put you in touch with reliable firms who can supply your need. This service is free to our readers. Use it.

Rock Products

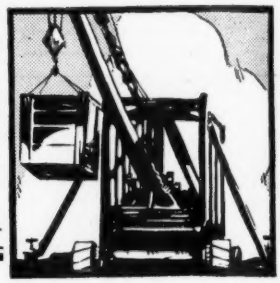
The Nation's Business Magazine of the Rock Products Industry

542 So. Dearborn St. Chicago, Illinois

BYERS AUTO-CRANE AND REVOLVING TYPES CRANES

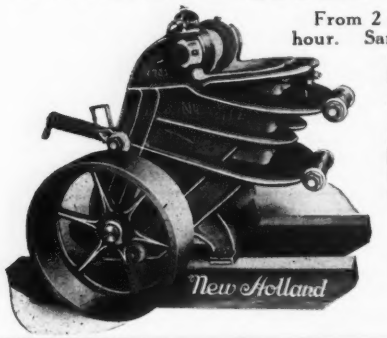
Let "Byers" lift your loads

Equipped with the attachment that best fits your job—clam, orangepeel, dragline, hook, magnet or skip — your "Byers" will see your work clear through to the finish. Two types—"Auto-Crane" and Full-Revolving. Over 700 in use. Specifications and full particulars gladly sent.



THE BYERS MACHINE COMPANY
310 Sycamore St.
RAVENNA, OHIO
Representatives in 25 Leading Cities.

New Holland Rock Crushers



From 2 to 10 ton capacity per hour. Sand Crushing and Pulverizing Machinery. Revolving Screens—Jolt Sifters, Elevators.

Highest in Quality, Large Capacity. Easy Running—Lowest Prices. Satisfaction Guaranteed.

Write for prices.

NEW HOLLAND MACHINE CO.
New Holland, Pa.

WHY? — WOOD DRILLS

Because They—

- **Drill faster**
- **Stand more abuse**
- **Need less repairs**
- **Thrive on hard work**

Men who know, prefer "WOOD DRILLS" Because they fill the bill and cut the cost.

Wood Drill Works

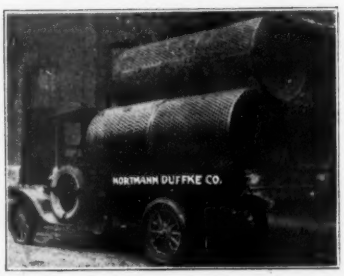
30-36 Dale Ave. Paterson, N. J.

"Hercules Solid Weld" Steam Shovel Chains

Best In the World. Will Actually Wear Out

The Columbus McKinnon Chain Company
Columbus, Ohio

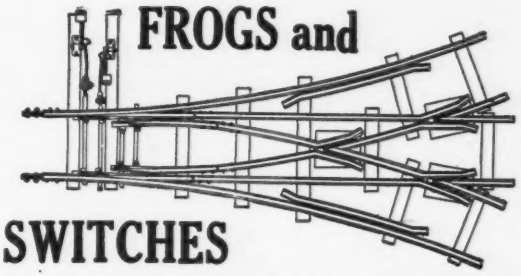
PERFORKATED SCREENS



We have the technical knowledge and the equipment that enables us to meet your most exacting needs quickly.

NORTMANN-DUFFKE CO.
1200 27th Ave.
MILWAUKEE, WIS.

OHIO
LOCOMOTIVE CRANES
OHIO LOCOMOTIVE CRANE CO.
POPLAR ST. BUCYRUS, OHIO

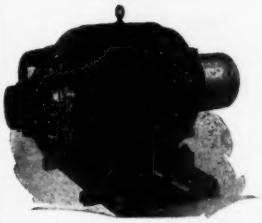


FROGS and SWITCHES

The Central Frog & Switch Co., Cincinnati, O.

Frogs, Switches, Crossings, Switch Stands, Rails, Angle Bars, Fishplates, Throws, Rail Braces, Tie Plates, Portable Track, Etc., Etc.

Electric Motors



Large Stock of New and Used

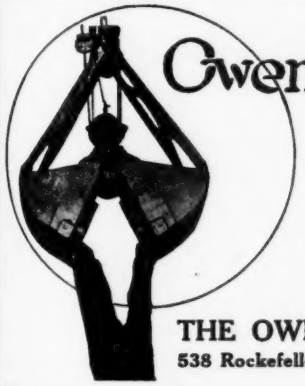
Motors and Generators

Repairs for Any Make or Type

Sorgel Electric Co., Milwaukee, Wis.

SCREENS of All Kinds

Chicago Perforating Co.
2445 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.



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combine dollar-saving features of bucket construction which are illustrated in our latest catalogue.

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FULL CIRCLE CRANES. "EQUIPMENT THAT LASTS." TIMBER & STEEL DERRICKS.

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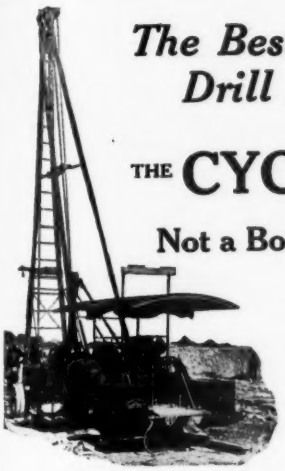

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We will prove the superiority of the No. 14 Drill by placing one of the outfits in your quarry against any or all other makes.

If the Cyclone doesn't out-drill and out-wear all other drills, we will remove it from the work without cost to you.

Our proposition gets below the paint—it eliminates talking points and evaporates hot air. It puts buying on a strictly engineering basis where it belongs.

Furnished in Steam, Gasoline, Compressed Air or Electric Power Traction or Non-Traction

Let us send you full particulars

The Sanderson-Cyclone Drill Co.
ORRVILLE, OHIO
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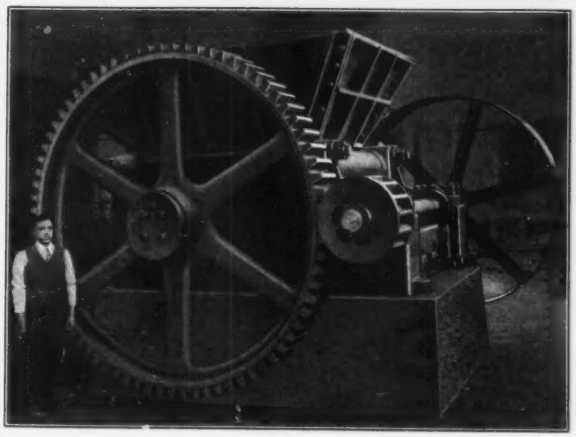

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After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

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Screens, Elevators, Conveyors, Rock Washers, etc.

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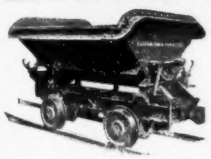

Ruggedly constructed Easton Rocker Dump Cars, cars of all types, standard or special, and complete narrow gauge railway equipment from track up—built for enduring service and backed up by thirty years of Easton experience—are available for every car haulage requirement in the rock products industry.

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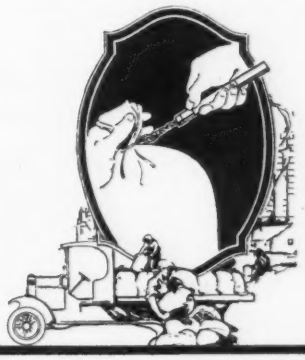

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Your bag tying costs are entirely too high—unless you now use the Bates Wire Bag Tying System. For economy, speed, security and durability you owe it to yourself to investigate the Bates System for your Bag Tying Work. It will pay you to **try** and then **buy**.

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The Bates Free Trial Bag Tying Outfit, containing one Bates Spring Return Tying Tool and 10 each of 4, 4½, 5, 5½ and 6 inch Bates Wire Ties, will be sent you, on receipt of your signed agreement to use this Bag Tying Outfit on your work for fifteen days and then send $4.00 for the outfit or return the tool to us. **These ties cost you nothing.**

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MYERS WHALEY SHOVELS

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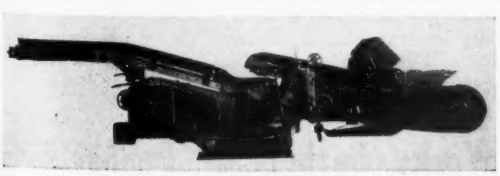

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IT WILL PAY YOU TO GET OUR PROPOSITION BEFORE YOU BUY

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It's designed with a capstan mounted well above the motor drive, so that a pull can be taken from any position. Its comparatively low rope speed and powerful gear ratio enable it to move heavy or light cars quickly and easily.

Metal cover for both motor and gear drives, when installed in the open.

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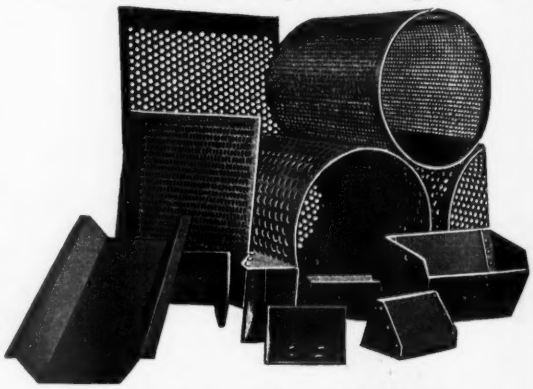

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General Sheet and Light Structural Work

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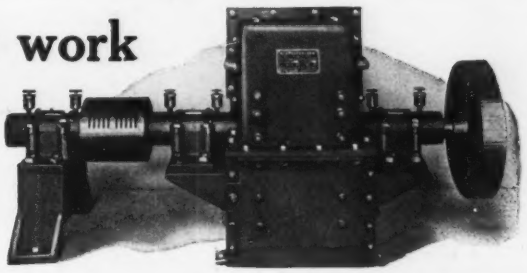
By the very nature of the work

it is called upon to perform a pulverizer must be much stronger than the material it handles.



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"K-B" is built ALL-Steel

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The Clyde Lime Hydrator Performance Counts

The Clyde was first in the field, and through dependable and economical performance is still first choice of lime operators.

The Clyde Hydrator produces big capacities of lime at only three-fifths the cost of any other hydrator on the market.

The Clyde not only produces over 90% of the hydrate of America, but makes the best quality of finishing lime from either high calcium or magnesium.

Simple, easiest to operate and most economical in cost of installing, maintaining, and operating.

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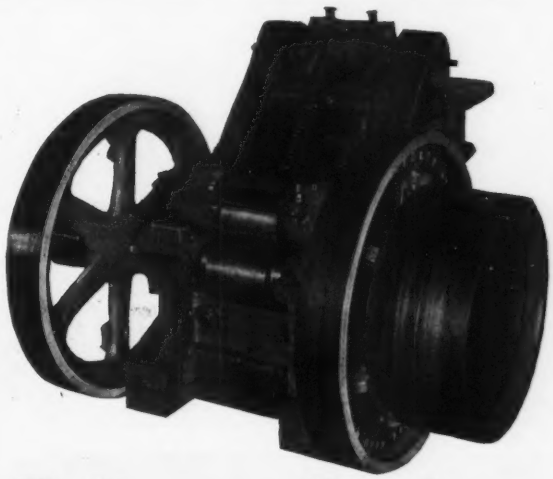

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IN ALL SIZES FOR EITHER PORTABLE PLANTS FOR ROAD BUILDING OR STATIONARY QUARRY INSTALLATIONS.

BUILT FOR LONG, HARD SERVICE—WILL SAVE YOU MONEY IN THE LONG RUN

Let us quote you prices

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Branches in all principal cities in U. S. and Canada
MANUFACTURERS OF THE FAMOUS RELIANCE LINE OF ROAD BUILDING AND QUARRY EQUIPMENT

The Kritzer Continuous Lime Hydrator

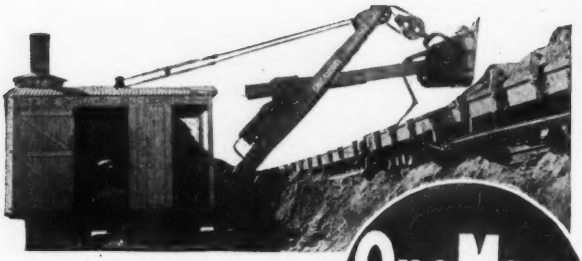
HYDRATE

Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

THE KRITZER COMPANY
503 South Jefferson Street CHICAGO, ILL.



One Man; 350 Tons

When you require an output of 800 to 1,000 tons of sand or gravel per day, a fireman is needed in addition to the steam shovel operator. But when you require about 350 tons or less, one man can often both operate and fire an ERIE Shovel. The Cumberland Sand Co., of Cumberland, Md., write us:

"Our labor cost is only a trifle; one man operates and fires our ERIE and keeps it in repair. The saving of labor means more efficiency and our output has increased considerably. To any prospective purchaser, we recommend the ERIE."—**A. K. Smith, Manager.**

Every ERIE Shovel easily and quickly changed over to Locomotive Crane to handle clamshell bucket.

The ERIE is very strongly built; gives steady service in hard work. Its output compares VERY FAVORABLY with that of larger and more costly shovels.

We will be glad to send you a bulletin showing just what the ERIE Shovel can do. Write for Bulletin P-16.

BALL ENGINE CO., Erie, Pa., U.S.A.
Builders of ERIE Steam Shovels and Cranes

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THE McMYLER INTERSTATE CO.
CLEVELAND OHIO

Handling Limestone With a Type "J" Locomotive Crane

This crane has proven to the satisfaction of a large number of owners that the heavier crane is the cheapest one to buy for some classes of service.

The Type "J" is only one of a large number of cranes manufactured by this Company.

We also manufacture a complete line of clamshell buckets.

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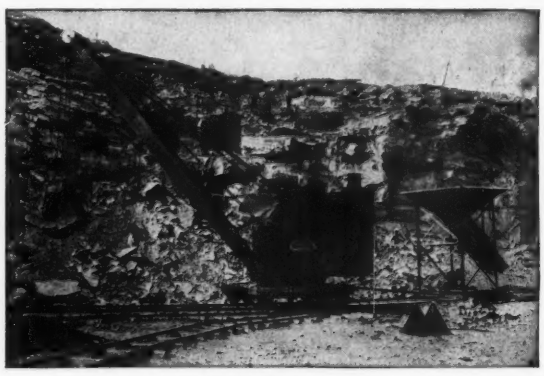
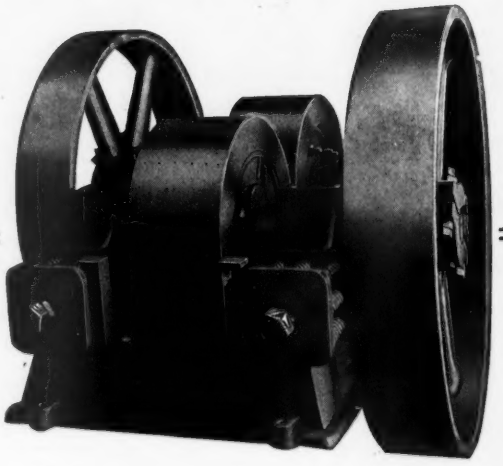


O. S. DEPENDABLE Locomotive Cranes

reduce expense of handling materials and increase profits and output wherever installed. Catalog No. 18 now ready. Its valuable information will simplify your problems.

ORTON & STEINBRENNER CO.
Chicago, Ill.
Factory—Huntington, Ind.



When you are in the market for Transmission Equipment, Screens, Elevator Buckets or Crushers, and want the best that can be had irrepective of price.

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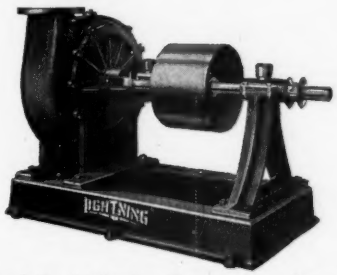
WEBB CITY & CARTERVILLE FOUNDRY & MACHINE WORKS
WEBB CITY, MISSOURI

The Lightning Sand Pump

Is No Loafer!

Operate like a flash! Adjusts in a flash! Parts replaced like a flash!



The life of the Lightning Pump is one long, unbroken streak of production.

Simple in design and construction.
Drum removable and adjustable to any position.
Drum plate quickly removable.
Ball thrust bearings, front and rear.
Chilled bumper in sand drum provides long wear.
Bumper quickly replaced.
Detailed description with prices on application.

Address Pump Dept.

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Stucco Buildings, Concrete Blocks or Bricks faced with Metro-Nite are beautiful, artistic and everlasting.

Metro-Nite White is of a crystalline character, really a siliceous dolomite. It is extremely hard, sharp and cleanly graded, making a bright, sparkling face.

Free samples mailed on request.

Two colors—White and Green.

The Metro-Nite Co.
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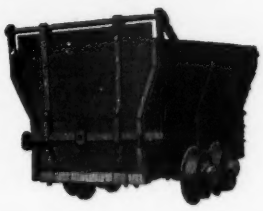

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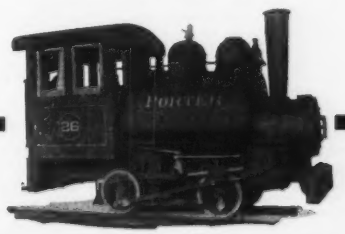
In the Porter shops are over two score skilled mechanics who have been building PORTERS for 25 years or more—Is it any wonder with men such as these that Porters give the kind of service that keeps them working year after year on the hardest jobs?

H. K. PORTER COMPANY
PITTSBURGH, PA.



Universal Crushers

The biggest value for your money. Universal crushers and pulverizers reduce stone to desired size or fineness in a jiffy! Fifteen years of designing and building experience have made possible the exceptional ability of Universals.

Universal Crusher Co.
225 Third Street
Cedar Rapids, Iowa, U.S.A.

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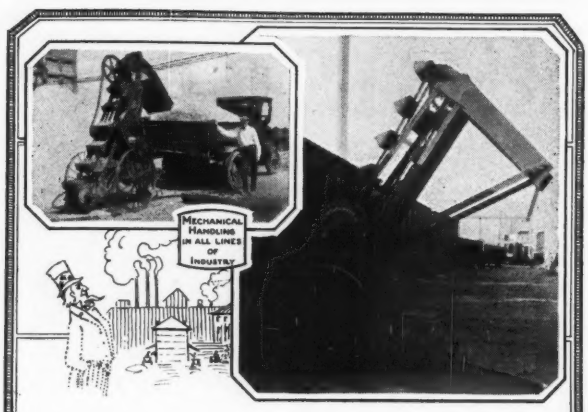

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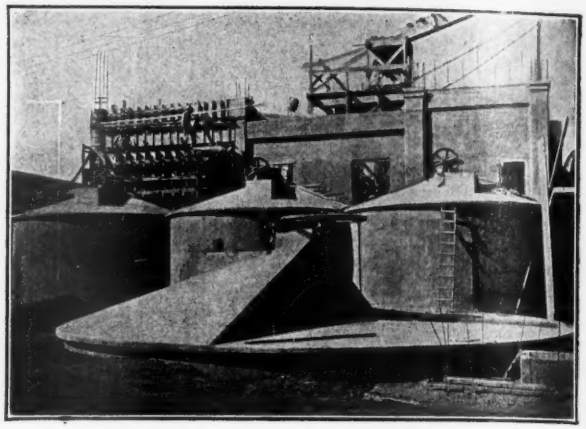
GIFFORD-WOODS Wagon Loaders are proving their economical value every day in handling loose material from ground storage. They are an economic necessity when material of this kind is handled in quantity.

Let us know your problem and we will submit a money saving plan at once.

Gifford-Wood Co.
NEW YORK CHICAGO MAIN OFFICE AND WORKS HUDSON, N.Y. BOSTON BUFFALO

A More Uniform Mix in Your Slurry



The Dorr Slurry Mixer

The action of the vertical air lift, combined with the rotating plow blades at the bottom of the tank and the distributing launders at the surface, prevents any stratification of the slurry and assures a thorough, uniform mix. In one plant where variations in the mix had been around 1%, the Dorr Slurry Mixer reduced this to 0.2%.

Other advantages are low maintenance cost, low power cost, lower first cost, and a saving in time. Let us send Bulletin 22.

THE DORR COMPANY
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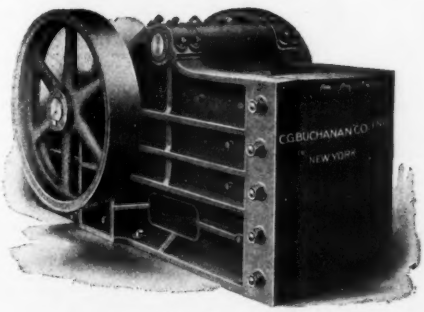
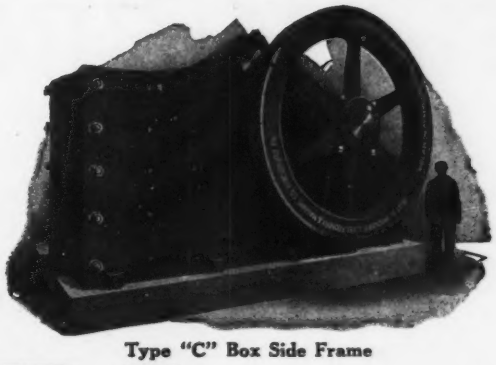
Denver London New York

Research Tests Equipment Design

When YOU Think of Buchanan-Think of Crushers



Type "C" Panel Side Frame



Type "C" Box Side Frame

BUCHANAN JAW CRUSHERS

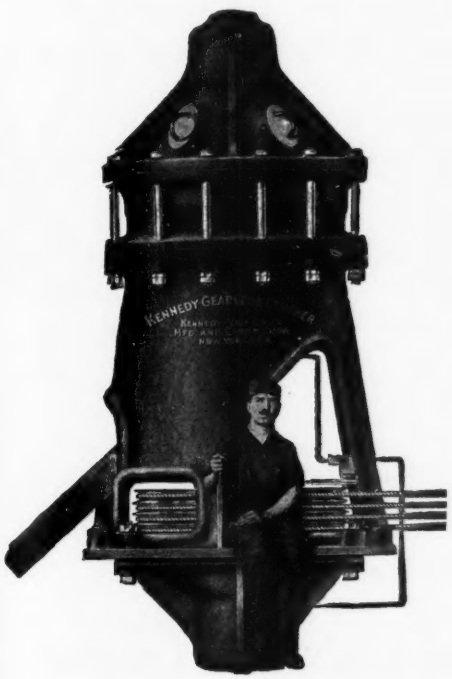
ALL STEEL PATENTED

Both "Panel" and "Box" type, side frame crushers, in stock for immediate shipment. Small crushers, also in sizes to meet your requirements. Prices in line with present exceptionally low prices of material.

C. G. BUCHANAN CO., INC., 90 West Street, New York

Crushing Machinery, Crushing Rolls, and Magnetic Separators

When You Think of Crushers-Think of Buchanan



One of the
K. V. S. Products

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GearLESS!

Hence no broken gears—and so steady operation—and very low upkeep.

Gearless! And so a crushing speed with either belt or rope drive, that makes possible a tonnage handled otherwise impossible.

Gearless! And so with power applied directly and with unusual flexibility.

To investigate the record of the KENNEDY GEARLESS CRUSHER is to open up a new efficiency and economy for all intermediate crushing.

Bulletin 2 gives details.

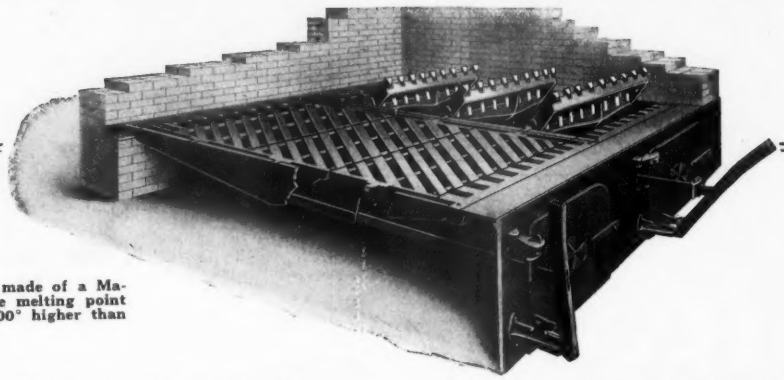
Kennedy-Van Saun Mfg. and Eng. Corporation

Complete Crushing and Screening Machinery for Ore, Rock and Pulp

120 Broadway, New York

Compagnie des Entreprises Industrielles, 40 Rue Des Mathurins, Paris, France

The McGINTY GRATE



Our Grates are made of a Material of which the melting point is from 400° to 600° higher than Gray Iron.

The McGinty Grate is scientifically designed and constructed to meet the high duty and capital requirements of Kiln and Hydrating practice.

It is a shaking and dumping grate, so constructed that it will withstand a higher degree of heat without warping than any other grate now on the market.

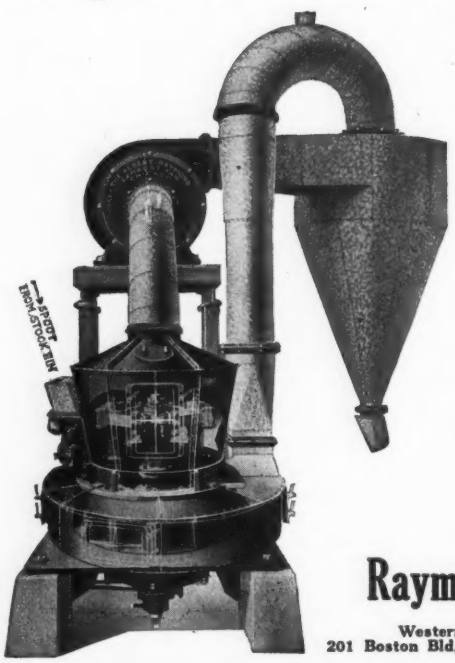
It has more air area, therefore will burn a lower grade of coal than is possible on old style bars.

You can clean fires with the doors closed. It is also a shifter, shaking and dumping grate combined; and the up-keep is lower than any other grate.

This grate must satisfy you or you needn't keep it.

The Kramer Bros. Foundry Co., Dayton, Ohio

Another cement plant has decided to use Raymond Mills and grind their coal to a fineness of 90 to 92% passing a 200 mesh.



The use of finer coal for burning your cement is well worth your investigation.

Consider a saving of 10 to 15% of your coal at an additional grinding cost of only 25% and we think you can easily see the economy in the finer grinding.

With Raymond Mills you can count on a capacity from each mill of from three to four tons per hour, depending upon grade of coal used, grinding to a fineness of 90 to 92% passing a 200 mesh, which gives a product showing 98 to 99% passing a 100 mesh.

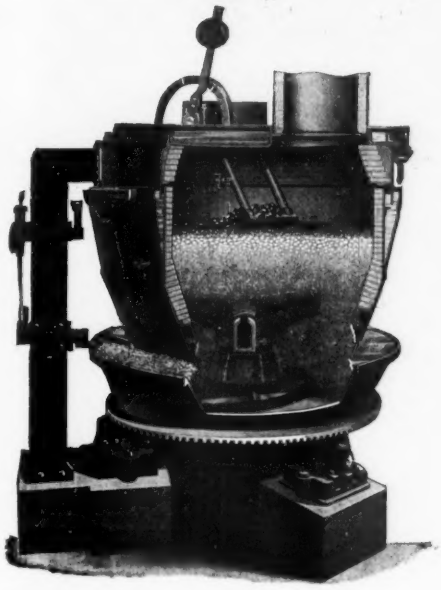
Complete figures will be gladly sent you

Raymond Bros. Impact Pulverizer Company

Western Office:
201 Boston Bldg., Denver, Colo.

1301 North Branch St., Chicago, Ill.

The Machine of Absolute Satisfaction



Selected by every large purchaser in the steel industry since the armistice. Three recent installations at leading Eastern Lime Plants.

POKERLESS PRODUCER-GAS MACHINE

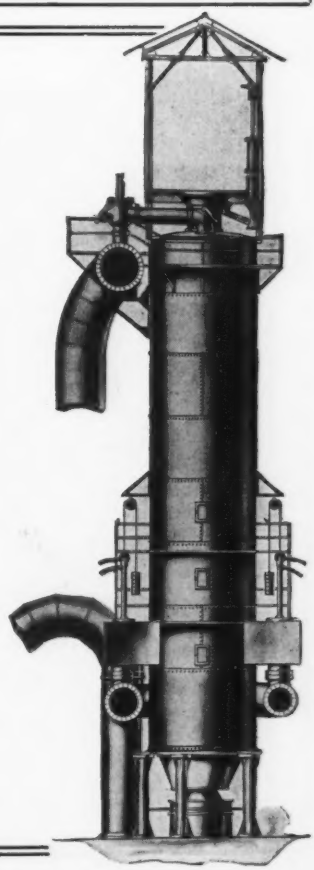
Users everywhere testify with one voice to the superior satisfaction and **low maintenance expense** of this splendid machine. Difference in first cost comes back annually; every detail built for endurance.

Morgan Construction Company
Worcester, Mass.

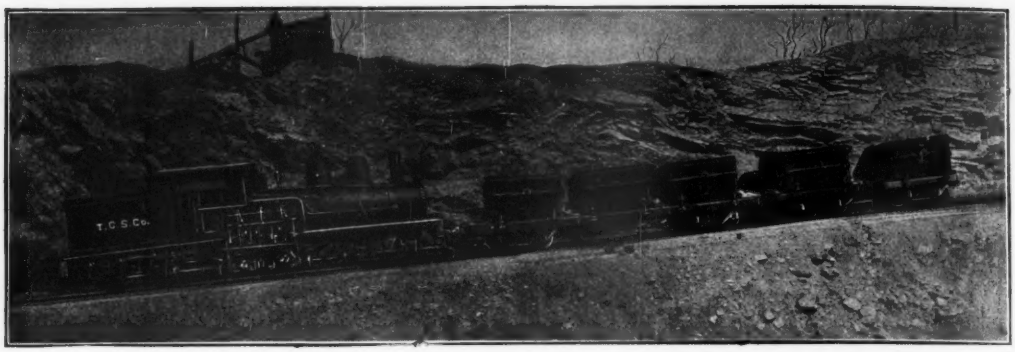
Continuous Discharge—Gas Fired
LIME KILNS

The wastefulness or efficiency of any lime burning apparatus is determined by the amount of fuel per ton of lime produced.

Our Kilns are not an experiment, but have successfully met the test of years of actual service. The design is the work of our Consulting Mechanical and Chemical Engineer, who has had many years of practical operative experience. They embody a number of labor saving devices, and are designed to secure maximum production with minimum fuel consumption; their record in this respect should interest every lime producer in the country.



Glamorgan Pipe & Foundry Company
Lynchburg, Va., U. S. A.
Using the Nationally Famous Virginia Foundry Irons



The "Shay" Will Do It

Because of their flexible geared drive, "Shay" engines will get out rock from places inaccessible to rod engines.

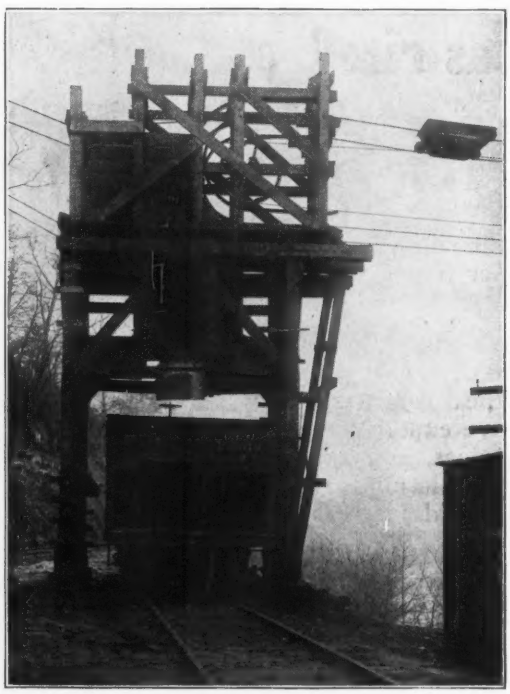
All wheels of a "Shay" are drivers—including the tank wheels.

The "Shay" is the most flexible and powerful kind of motive power you can use.

The power is supplied by the three cylinders, producing a constant torque.

LIMA LOCOMOTIVE WORKS, Inc.

LIMA, OHIO **17 E. 42nd St., New York**



With such equipment operators of mines and quarries are moving thousands of tons daily

Break Jail! Why Be a Prisoner to High Production Costs

when the

AUTOMATIC AERIAL TRAMWAY

will serve as a means of reducing expenses and enable you to meet competition?

More Tons Moved
Less Labor Required

Man Power Is Waste Where Machinery Will Do the Work

Let Us Solve Your Problem

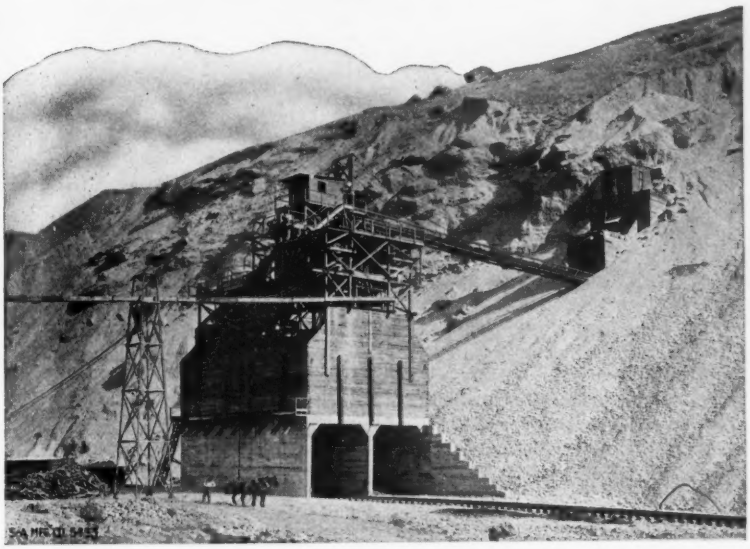
Write Us for Photographs and Description

Interstate Equipment Corporation

25 Church Street **New York City**

Is the Product Up to Specification?

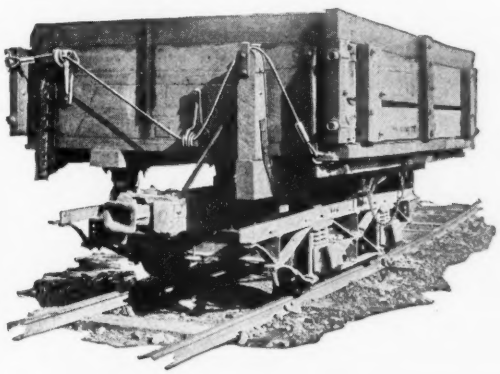
To be ready to furnish "specification" sand and gravel for the new road projects and for the building season, it is essential that your plant be equipped with modern machinery. Contractors will demand clean, sized gravel and clean, sharp sand for their work. Careful preparation of the raw products will mean the production of salable material.



To meet the requirements, the producer of sand and gravel has been compelled to abandon the old method of hauling his material direct from the point of supply to the construction site. It is necessary now to screen the sand and gravel to meet specified size requirements, and to wash the product to remove the dirt, clay and vegetable matter, eliminating the possibility of disintegration which might be caused from the presence of such detrimental foreign matter.

Our engineers will design your entire new plant or will re-design your old plant.

Stephens-Adamson Mfg. Co.
AURORA, ILLINOIS



Modernize Your Old Quarry Cars

Improve your equipment. Rebuild your worn-out two-way contractor's car to a one-way mechanically dumped car.

Your plant repair man and blacksmith can do it during slack times, and the cost will be no greater than to rebuild the car to its original type.

This car can be dumped by a ram, air-hoist or any sort of friction drum belted to a convenient shaft.

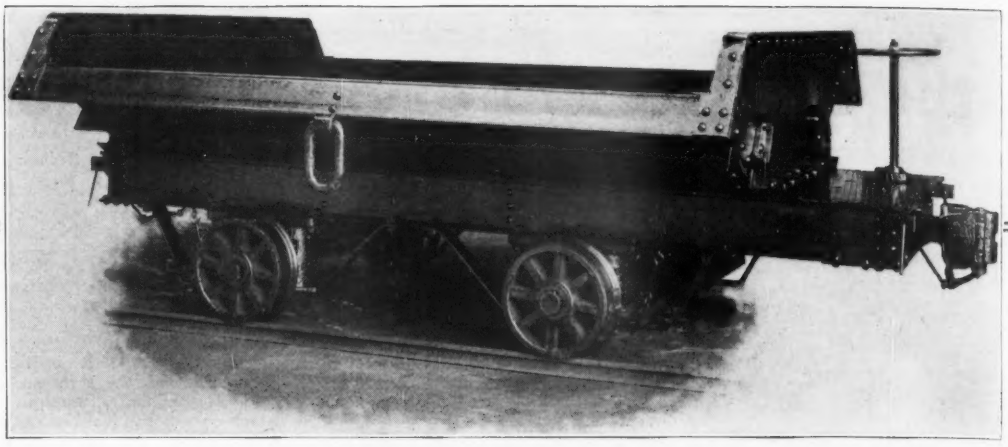
An increase of 20% carrying capacity added to the car because the load rests squarely on the truck frame and thrusts or jolts are taken care of.

The drop door opens as the body is tilted and closes as the body returns to normal position.

Let me sell you the privilege of using my patent, together with sample castings, detail drawings and photographs.

Write for full information, including several testimonials.

G. L. HANCOCK
Box 142 **Geneva, N. Y.**



BUY ATLAS CARS

We say "Buy Atlas Cars" because they are dependable. Buy them because of their record for reliability. Buy them because of their unequalled service combined with our methods of reinforcing assures uninterrupted performance.

We have built cars so long and for so many people we know just where the reinforcing should go and just how it should be done.

THE ATLAS CAR AND MANUFACTURING CO.

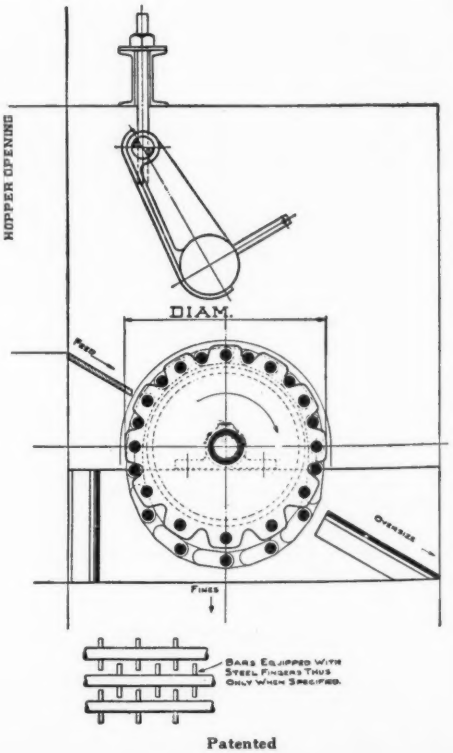
Engineers, Manufacturers **Cleveland, Ohio, U. S. A.**

Ross Automatic Drop Bar Grizzly Feeder and Screen

"For use in Mining, Smelting, Sand, Gravel, Crushed Stone, Coke, Coal, Blast Furnaces and numerous other plants."

"Cannot block or choke—will handle material at an even rate for 24 hours a day without labor or attendance."

"Replaces all types of Revolving Screens at a less cost per unit and less cost for horse power with greater tonnage and less repair cost."



Manufactured and sold exclusively by

Chalmers & Williams, Inc.

1425 Arnold St. **Chicago Heights, Ill.**

Patented

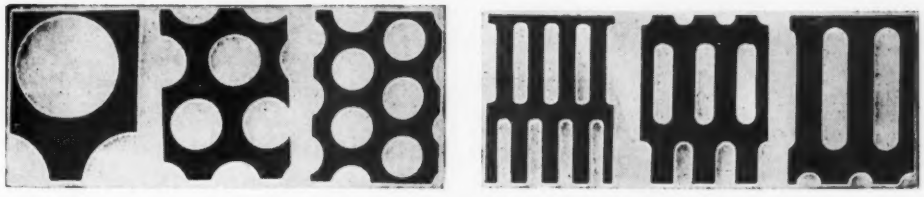
USE

Cordeau-Bickford
Detonating Fuse

For well drill blasting and the tunnel and pocket method of blasting, where large quantities of explosive are to be detonated, use safe, efficient Cordeau-Bickford and get lower blasting costs.

The Ensign-Bickford Co., Simsbury, Conn.
Established 1836 **Original Makers of Safety Fuse**

PERFORATED METALS



All sizes and shapes of holes

For Screening Stone, Gravel, Sand, Cement and all Minerals

A well made screen of carefully selected material will last longer and be more satisfactory to the user than one which is rushed out without regard to quality. Perforated Metal is the sole product of our plant and when we ask for your order it is not one only that we want, but your permanent trade, and we make our one product worthy of your good-will.

We build every type of perforated metal screen for every requirement. Flat plates or cylindrical sections and segments with any kind of perforations.

THE HARRINGTON & KING PERFORATING CO.

New York Office
114 Liberty St.

621 North Union Ave., Chicago, Ill., U. S. A.

SIMPLICITY AND DURABILITY

ARE CHARACTERISTIC FEATURES

OF THE ARMSTRONG BLAST HOLE DRILL

Traction or Non-Traction

There are no flimsy, complicated parts to cause worry, trouble and expense. Has fewer moving and working parts than any similar machine built.

Don't try to get efficiency from a Blast Hole Drill using cast gears, sprockets, chains, cams or superstructures to produce the drilling motion. The simple and durably constructed Overhead Spudding Beam on the "Armstrong" eliminates all of these.

Write today for particulars

Armstrong BLAST HOLE DRILLS
BUILT FOR SERVICE SINCE 1867

ARMSTRONG MANFG. COMPANY
DEPT. A
WATERLOO, IOWA, U. S. A.

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Baxter Springs, Kansas
New York, 30 Church St.

SALES AGENTS:
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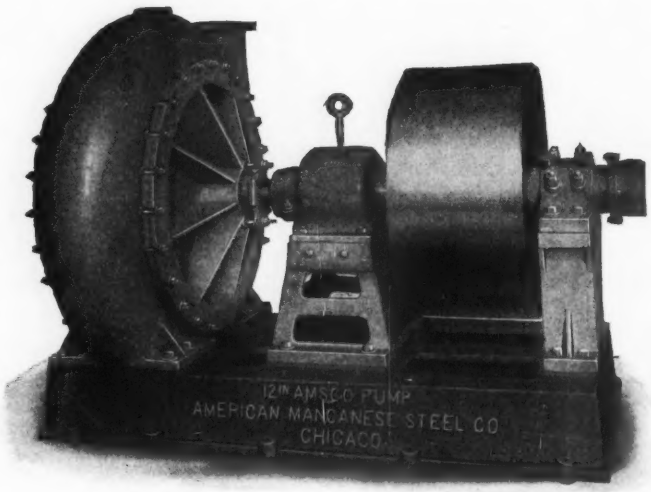
The Kaufman Co., Los Angeles
Collins Ferguson Co., Seattle, Portland
Lund & Co., Salt Lake City

AMSCO SAND AND GRAVEL PUMPS



Are Dependable Producers

Save delays
More operating days
Lowest cost per yard pays

Built of rugged construction for hard service. Shell, side plates and runner—parts exposed to abrasive wear and constant grinding action—are made of manganese steel.

Extra heavy shaft, sturdy bearings, ball bearing thrust collar and well balanced runner, make the AMSCO pump a smooth-running and efficient machine.

AMSCO Flap Valves, Pipe and Elbows

Write for Pump Bulletin

American Manganese Steel Company

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Western Sales Office: Newhouse Bldg., Salt Lake City
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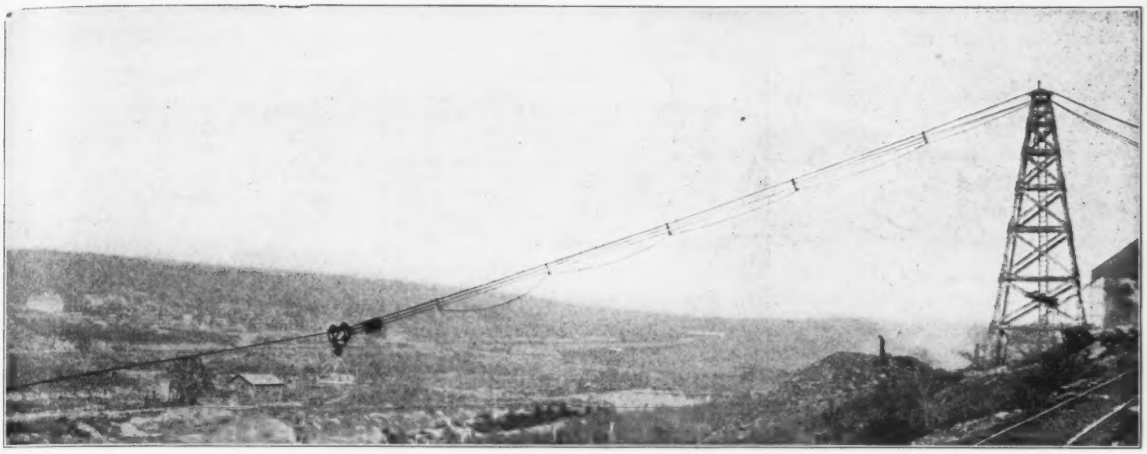
Eastern Sales Office: Hudson Term. Bldg., N. Y.
Foundries: Chicago Heights, Ill. — New Castle, Delaware — Oakland, California

FLORY CABLEWAYS



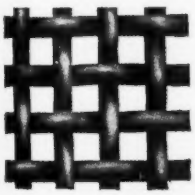
A Flory Hoist or Cableway for Every Purpose

A Flory Cableway May Solve Your Hoisting and Conveying Problems

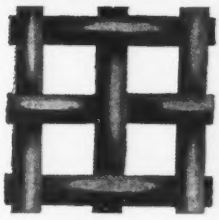
OUR ENGINEERS ARE AT YOUR SERVICE

S. FLORY MANUFACTURING CO., Bangor, Pennsylvania

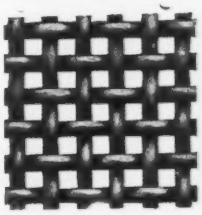
New York: 95 Liberty St. Pittsburgh: Wabash Bldg. Chicago: Monadnock Block
Hartford: K. B. Noble Co. Birmingham, Ala.: Chas. T. Lehman



3½ Mesh; .135 Wire



2 Mesh; .192 Wire



5 Mesh; .105 Wire

"CLEVELAND" DOUBLE CRIMPED WIRE CLOTH

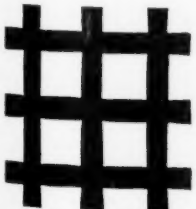
is unequalled for the screening of sand, gravel, crushed stone, limestone and cement.

With the use of "Cleveland" Double Crimped Wire Cloth comes the assurance of a uniform fineness in your product that will prove beneficial to you in exact proportion to the satisfaction given your customer.

A large stock always on hand. Special meshes made to suit requirements. Prices right

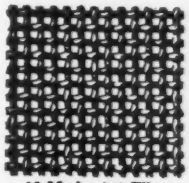
THE CLEVELAND WIRE CLOTH AND MANUFACTURING COMPANY

3573 East 78th St. Cleveland, Ohio



2½ Mesh; .105 Wire

No. 23—Rolled Slot



18 Mesh; .047 Wire

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Classified Directory of Advertisers in Rock Products

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New York, N. Y.

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Bates Valve Bag Co.
Chicago, Ill.
Jaite Co., The
Jaite, Ohio
Miller, Tompkins & Co.
New York City.
Valve Bag Co. of America
Toledo, Ohio.

Belting
Cincinnati Rubber Mfg. Co.
Cincinnati, Ohio.
Hettrick Mfg. Co.
Toledo, Ohio
New York Belting & Packing Co.
New York, N. Y.

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Wert Mfg. Co.
Chicago, Ill.

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Cleveland, Ohio.
Hercules Powder Co.
Wilmington, Del.

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Carbondale, Pa.
Orton & Steinbrenner
Chicago, Ill.

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Austin Mach. Corp.
Chicago, Ill.
Brown Hoisting Mach. Co.
Cleveland, Ohio.
Browning Co.
Cleveland Ohio.
Marion Steam Shovel Co.
Marion, Ohio.
McMyler Interstate Co.
Cleveland, Ohio.
Owen Bucket Co.
Cleveland, Ohio.

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Bangor, Pa.
Interstate Equip. Co.
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U. S. Chain & Forging Co.
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Kingston, N. Y.

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Fullerton, Pa.
Good Roads Mach. Co.
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Cleveland, Ohio.

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Baldwinsville, N. Y.
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New York, N. Y.

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Chicago, Ill.

Powder
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Wilmington, Del.
Grasselli Powder Co.
Cleveland, Ohio
Hercules Powder Co.
Wilmington, Del.

Pulverized Fuel Equipment
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New York, N. Y.

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American Steel & Wire Co.
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St. Louis, Mo.

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Sauerman Bros.
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Hudson, N. Y.
Hendrick Mfg. Co.
Carbondale, Pa.
Jeffrey Mfg. Co., The
Columbus, Ohio
Link Belt Co.
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National Engineering Co.
Chicago, Ill.
Smith Eng. Works
Milwaukee, Wis.
Stephens-Adamson Mfg. Co.
Aurora, Ill.
Stimpson Equip. Co.
Salt Lake City, Utah
Sturtevant Mill Co.
Boston, Mass.
Tyler Co., The W. S.
Cleveland, Ohio
Universal Road Mach Co.
Kingston, N. Y.

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Rubert M. Gay Co.
New York City.
National Engineering Co.
Chicago, Ill.
Raymond Bros. Impact Pulv. Co.
Chicago, Ill.
Sturtevant Mill Co.
Boston, Mass.
Tyler Co., The W. S.
Cleveland, Ohio

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Buchanan Co., C. G., Inc.
New York, N. Y.

Shovels—Steam and Electric
Austin Mach. Corp.
Chicago, Ill.
Ball Engine Co.
Erie, Pa.
Bucyrus Co.
S. Milwaukee, Wis.
Marion Steam Shovel Co.
Marion, Ohio
Osgood Co., The
Marion, Ohio

Shoveling Machines
Myers-Whaley Co.
Knoxville, Tenn.

Speed Reducing Transmission
James, D. O., Mfg. Co.
Chicago, Ill.

Stucco Facings
The Metro-Nite Co.
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Tyler Co., The W. S.
Cleveland, Ohio

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..... Drill Sharpening Machinery.
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..... Stone Grapple.
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..... Tanks, Wood.
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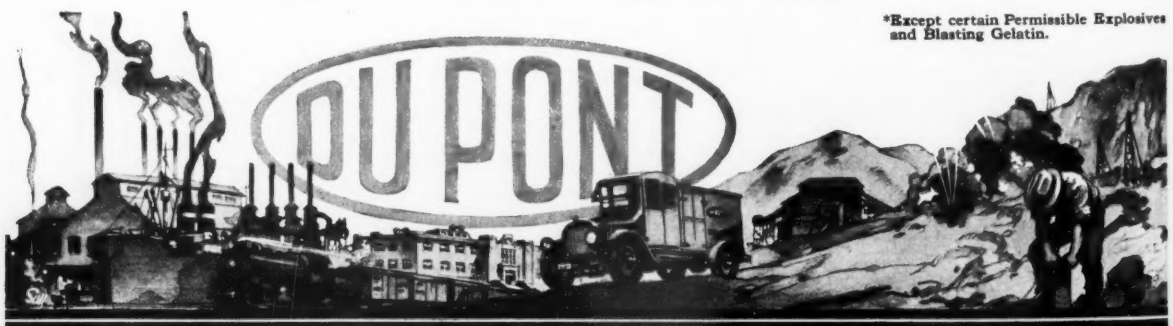

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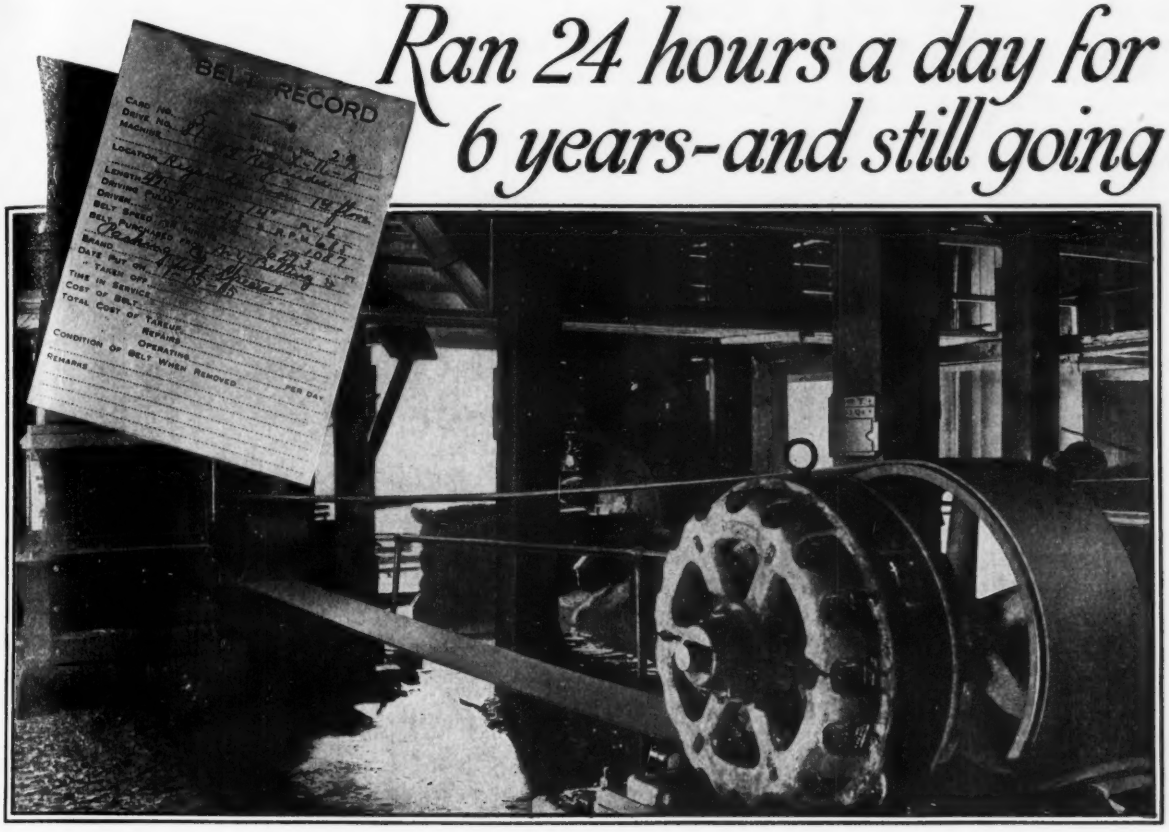

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